CANBERRA BOTANIC GARDENS



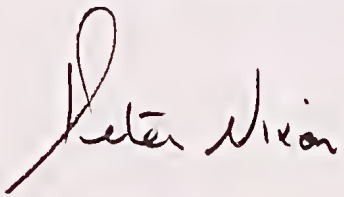
CANBERRA BOTANIC GARDENS

A DEPARTMENT OF THE INTERIOR PUBLICATION

Walter Burley Griffin in his plan for Canberra, provided for botanic gardens surrounding an artificial lake. He saw the gardens as a plant collection from all parts of the world set out in continental groups. As the city has grown this concept has changed. The collection has been confined to Australian species, from all the States and some of the Territories, and the location has been moved to the lower slopes of Black Mountain. This Australian emphasis strengthened the national significance of the project and is particularly fitting for Australia's capital.

The Botanic Gardens are unique in their nature, size and scope. They are of major educational and scientific value to visitors from all parts of the world, as well as Australians. They are very much in keeping with the Government's decision to support the preservation of Australian flora.

The gardens are of an informal type and, although not planned as an active recreational facility, are a place for quiet relaxation and abiding interest.



October 1970

Minister for the Interior

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The Waratah, *Telopea speciosissima* now widely cultivated and the floral emblem of New South Wales

JOSEPH BANKS
THE FIRST COLLECTOR

"... persuade Solander to send me some specimens of plants from Banksia in Terra Australis: for the new-found country ought to be named 'Banksia' from its discoverer. ..."
(Linneaus to John Ellis, F.R.S., 1771.)

The official opening of Canberra's Botanic Gardens in October 1970 can be regarded as an event of special significance among the many arranged to celebrate the 200th anniversary of the discovery of the east coast of Australia by Captain James Cook.

Without detracting from the credit due to the great navigator for his remarkable achievement, it is fair to say that the interest shown by Joseph Banks, before, during and after the famous voyage of the *Endeavour*, led to the foundation of Sydney and the birth of the nation.

At the age of 23, Joseph Banks had been elected to membership of the Royal Society. The wealthy young Lincolnshire squire had already travelled to Newfoundland and Labrador as a naturalist member of scientific expeditions.

When the Royal Society received the approval of their Patron, George III, for the dispatch of an expedition to some place in the South Pacific where astronomers could observe the transit of Venus, young Banks eagerly offered to join the company and pay the expenses of a famous botanist, Dr. Solander, four artists and two personal servants.

The objective was the study of natural history in Tierra del Fuego, Tahiti and any other places where the *Endeavour* might call, perhaps even the fabulous great South Land of the early cartographers.

The equipment Mr. Banks stowed aboard, a Library of Natural History, "all sorts of machines





Two of the illustrations from The Endeavour Journal of Joseph Banks. Left: *Banksia serrata* (Red Honeysuckle) and right: *Kennedya rubicunda* (Red Bean)

for catching and preserving insects, net drags and hooks for trawling, many cases of bottles with ground glass stoppers, several sorts of salts to surround seeds . . ." and an enormous variety of other equipment, cost him more than £10,000, or twice as much as the cost of the ship itself.

The two diaries of the voyage, meticulous records made by Cook the navigator and Banks the naturalist, reveal the deep interest each had in the other's work and opinions.

During the week's stay in the yet un-named bay of *Endeavour*'s first anchorage on his newly discovered east coast, Cook made many excursions, and his diary records his observations in terms to be expected from one who had been an observant farm labourer in his youth. Such entries as ". . . the trees are at such a distance from one another, that the whole country, or at least a great part of it, might be cultivated without being obliged to cut down a single tree".

Banks, though less impressed by agricultural prospects, was fascinated by the tremendous collection he had made of unique flora. He records that one day he "carried ashore all the drying paper, nearly two hundred quires, of which the greater part was full, and spreading them upon a sail in the sun, kept them in this manner exposed all day, and sometimes turning the quires in which there were plants inside out. By this means they came on board at night in very good condition."

The evening before *Endeavour* sailed, some of the sailors "returned from fishing, having caught two stingrays weighing near 600 lbs.", and Cook wrote: "The great quantity of this sort of fish found in this place occasioned my giving it the name of Stingray Harbour."

But, somewhere on the voyage up the coast, no doubt upon the urging of the naturalists, Cook scratched his pen through the phrases "this sort of fish" and "Stingray Harbour" and made amendments which caused the sentence to become—"The great quantity of new plants, etc., Mr. Banks and Dr. Solander collected, occasioned my giving it the name of 'Botanist' (then altered to Botany) Bay."

In all his travels up to this time, young Joseph Banks (just turned 27) had been able to discuss native flora with the local inhabitants. In New Zealand, they found the Maori language readily understood by Tupia, the Tahitian who had joined *Endeavour* as guide and interpreter for the South Sea Islands exploration. But the language and dialects of the people of the east coast of Van Diemen's Land, soon to be called New South Wales, was not understood. Aboriginal names for some of the strange animals and curious plants were noted but the language barrier and the shortage of time ashore did not allow opportunity to discover what the native people had found out about the dietary, medicinal and other uses of the flora . . . knowledge discovered and handed down from father to son over more than 30,000 years. This was a study that had to wait.

But the botanists took calculated risks. During the first few days in Botany Bay, Banks had come upon some *Tetragonia expansa*; passed leaves over to the cook to boil and serve with tripe, and then recorded ". . . which eat as well as spinage, or very near it". Banks introduced this to English palates on his return, and though generally reckoned inferior to spinach, it has a large yield in climates where the common spinach fails, and where spinach produces late in the season it supplies an earlier vegetable.

Cook the explorer was keen to proceed up the coast and map its shoreline. The week in Botany Bay which had been long enough for him, had given the naturalists a collection of plants "now grown so immensely large that some extraordinary care should be taken of them lest they should spoil in the books". At sea again, Banks and his colleagues expressed no desire to land anywhere along the coast, but at Bustard Bay (near where Brisbane now stands), and at Thirsty Sound, Banks and Solander joined landing parties who went ashore to get fresh water.

Of the flora of Bustard Bay he wrote: ". . . swamps and boggs of salt water grow many mangrove trees (probably *Ceriops candolleana* and *Bruguiera gymnorhiza*). Upon the sides of the hills were many of the trees yielding a gum like Sanguis draconis (Dragon's blood: in earlier English parlance 'gum-dragon', the resinous tragacanth which exuded from the tragacantha shrub or its allied species), they differed however from those seen in the last harbour in having their leaves longer and hanging down like those of one weeping willow (*Eucalyptus crebra* is the principal species alluded to). . . ."

In Thirsty Sound, Banks encountered "one kind of grass . . . very troublesome to us; its sharp seeds were bearded backwards and whenever they stuck into our cloths were by there beards pushed forward till they got into the flesh; this grass was so plentiful that it was hardly possible to avoid it and with the Musketos that were likewise innumerable made walking almost intolerable." (That was the comment of a wealthy young man who counted such irritations and



hardship as preferable to making the Grand Tour of the salons and courts of the Continent.)

Aboard *Endeavour*, while Cook was busy charting and navigating and watching over the work of the ship's company, Banks and Solander were putting into order their almost overwhelmingly rich collection, while Mr. Sydney Parkinson, Natural History painter to Mr. Banks, struggled in vain to keep pace and produce finished coloured drawings of the plants. In despair, he adopted the plan of making pencil outlines of the plants, adding a little colour to indicate the key, and making notes on the back for guidance in finishing the work later. Sometimes he was able to make the finished drawing himself, but not often.

Sydney Parkinson died soon after the *Endeavour* left Batavia on the voyage home, and it was left to Banks' other botanical draughtsmen, Frederick P. Nodder, John F. Miller, James Miller and James Clevely, to finish the work in England over a long period of years. Their work is eloquent testimony to the faithful recording of the master craftsman Parkinson.

The storage space allotted to the naturalists at the beginning of the voyage, then regarded as ample and to spare, was crammed to capacity after the Botany Bay collection, and many specimens had to be stowed away in odd corners of the tiny ship. Some stored in the bread room were spoiled when bilge water flooded the room after the beaching of the ship for repairs to the hull damaged by grounding on Endeavour Reef on June 10, 1770.

For five weeks, while Cook was supervising repairs, Banks and Solander toiled at "plant gathering", roaming far afield and seeing new wonders of nature, including "an animal as large as a greyhound and very swift; nothing that I have seen at all resembles him. We observed, much to our surprise, that instead of going on all fours, the animal went only upon two legs, making vast bounds." Banks also described termite nests which reminded him of Stonehenge, and shellfish larger than had ever been seen. But the magic of the wonderland lost some of its charm after the *Endeavour* was refloated and the sails were set for home. The exuberant sightseer became again the sober, careful recorder. In his "Some account of that part of New Holland now called New South Wales", he wrote:

"For the whole length of coast which we sailed along there was a sameness to be observed in the face of the countrey very uncommon; barren it may justly be called and in a very high degree, that at least that we saw.

"The soil in general is sandy and very light; on it grows grass tall enough but thin sett, and trees of a tolerable size, never however near together, in general 40, 50 or 60 feet asunder. This, and spots sometimes very large of loose sand constitutes the general face of the countrey as you sail along it, and indeed of the greatest part even after you have penetrated inland as far as our situation would allow us to do.

"The banks of the bays indeed are generally clothd with thick mangroves sometimes for a mile or more in breadth; the soil under these is rank mud always overflowed every spring tide.

"Inland you sometimes meet with a bog upon which the grass grows rank and thick so that no doubt the soil is sufficiently fertile.

"The valleys also between the hills where runs

Helichrysum elatum, a common flower of the East Coast



Sir Joseph Banks (Rex Nan Kivell collection)

of water come down are thick clothd with underwood, but they are generally very steep and narrow, so that upon the whole the fertile soil bears no kind of proportion to that which seems by nature doomed to everlasting barrenness. . . ."

On the homeward run after two years of perilous voyaging in the cramped quarters of the little converted collier, only 105 feet long by 29 feet broad and a draft of less than 14 feet, thoughts of England's green and pleasant land, the well tilled fields and the tidy hedgerows of his Lincolnshire estate, must have forced a comparison that was hardly favourable to the vast, lonely land he was leaving.

The wild enthusiasm of the week in Botany Bay had waned a little by the time the scientists had reached the tropics. On the shores of Botany Bay they were seeing plants hitherto unknown; in the tropical north they began to recognize species common to Java and the Indies generally. Many of these were noted in passing, but the record elaborated on those he regarded as uniquely indigenous, and often the comment was uncomplimentary.



Grevillea capitellata. Grevilleas attract nectar-feeding birds

"A soil so barren and at the same time intirely void of the help derived from cultivation could not be supposed to yield much towards the support of man. We had been so long at sea with but a scanty supply of fresh provisions that we had long used to eat everything we could lay our hands upon, fish, flesh or vegetable which only was not poisonous, yet we could but now and then procure a dish of bad greens for our own table and never but in the place where the ship was careened met with a sufficient quantity to supply the ship. There indeed Palm Cabbage and what is called in the West Indies 'Indian Kale' were in tolerable plenty, as was also a sort of purslane. The other plants we eat were a kind of beans (very bad) a kind of parsley and a plant something resembling spinage, which two last grew only to the southward. I shall give their botanical names as I believe some of them were never eat by Europeans before: first, Indian Kale (*Arum Esculentum*), Red flowered purslane (*Sesuvium Portulacastrum*), Beans (*Cycline speciosa*), Parsley (*Apium*), Spinage (*Tetragonia cornuta*). Fruits we had still fewer, to the South was one something resembling a heart cherry only the stone was soft (*Eugenia*) which had nothing but a light acid to recommend it; to the Northward again a kind of Figs growing from the stalk of a tree, very indifferent (*Ficus caudiciflora*), a fruit we called Plumbs, like them in colour but flat like a little cheese, and another much like a damson, both in appearance and taste; both these last however were so full of a large stone that eating them was but an unprofitable business. Wild Plantanes we had also but so full of seeds that they had little or no pulp.

"For the article of timber there is certainly no want of trees of more than middling size and some in the valleys very large, but all of a very hard nature; our carpenters who cut them down for firewood complained much that their tools were damaged by them.

"Palms here were of three different sorts. The first which grew plentifully to the southward had leaves pleated like a fan; the cabbage of these was small but exquisitely sweet and the nuts which it bore in abundance a very good food for hogs.

"The second was very much like the real cabbage tree of the West Indies, bearing large pinnated leaves like those of a Cocoa nut; these too yielded cabbage if not so sweet as the other sort yet the quantity made ample amends.

"The third, which as well as the second was

found only in the Northern parts, was low, seldom ten feet in hight, with small pennated leaves resembling those of some kinds of fern; cabbage it had none but generally bore a plentiful crop of nutts about the size of a large chestnut and rounder. By the hulls of these which we found plentifully near the Indian fires we were assured that these people eat them, and some of our gentlemen tried to do the same, but were deterred from a second experiment by a hearty fit of vomiting and purging which was the consequence of the first. The hogs however, who were still shorter of provisions than we were, eat them heartily and we concluded their constitutions stronger than ours, till after about a week they were all taken extremely ill of indigestions, two died and the rest were saved with difficulty.

"Other useful plants we saw none, except perhaps two might be found which yield resin in abundance; the one a tree tolerably large with narrow leaves not unlike a willow which was very plentiful in every place into which we went. This yielded a blood-red resin very nearly resembling Sanguis draconis, indeed as Sanguis draconis is the produce of several different plants, this may perhaps be one of the sorts. This I should suppose would be the gum mentioned by Dampier in his voyage round the world, and by him compared with sanguis draconis, as possibly also that which Tasman saw upon Diemens Land, where he says he saw gum of the trees and gum Lac on the ground. (See his voyage in a collection published at London in 1694, p. 133.) The other was a small plant with long narrow grassy leaves and a spike of flowers resembling much that kind of Bulrush which is calld in England 'Cats tail'; this yielded a resin of a bright yellow colour perfectly resembling Gambouge only that it did not stain; it had a sweet smell but what its properties are the chymists may be able to determine.

"Of plants in general the country afforded a far larger variety than its barren appearance seemed to promise. Many of these have no doubt properties which might be useful. . . ."

On July 13, 1771, the *Endeavour* arrived home. Captain James Cook reported to the Admiralty the discoveries made, saying he flattered himself that "though not great, they will apologise for the length of the voyage".

Young Joseph Banks made his report to the Royal Society, revealing botanical discoveries that astonished his fellow members, and the word went round rapidly. The great Linneaus wrote to his pupil Dr. Solander, through Mr. John Ellis, Fellow of the Royal Society, pleading that he should not set out on a proposed new voyage until he had catalogued "this matchless and truly astonishing collection, such as has never been seen before, nor may ever be again".



Leptospermum flavescens. One of the many attractive and hardy Tea-trees. A "Common Brown" butterfly rests on its blossoms below



Cook, the great navigator and discoverer, was soon off to sea again, his interest in the lands he had discovered was mainly in their positioning on the world map. His joy was in his contribution to geography, it was for others to suggest use and development. In 1779 he was dead, clubbed to death by frenzied natives on a coral beach of the Sandwich Islands.

Banks, the naturalist, scholar and man of means, was more concerned with developing the economic aspects of the knowledge gained. In each newly discovered plant he hoped other researchers would find elements which nature had intended for the use of man. He looked at new lands with an eye for their potential as new habitats for people who had the skills and energy to develop them. Back home at last, he could reflect calmly on the things he saw in Botany Bay and all along the eastern shores of the lonely land, and he began to see its possibilities.

By 1778, the year before Cook died, Joseph Banks was elected President of the Royal Society, at 35 the youngest ever to achieve the high honour and position of influence. The more he thought of New South Wales the more sure he was that an effort should be made to establish a settlement. America had declared its independence, closing off the transportation to its shores of victims of England's harsh penal laws, and Banks saw the opportunity. Perhaps not the ideal sort of people to make the experiment, but apparently the only ones who could be induced, and he urged a committee of the House of Commons to establish a penal colony at Botany Bay.

Whether he had really become convinced that the new land had virtues he had not properly appreciated during his brief visit is something for cynics to ponder, but when in 1786 it was decided to send out a few shiploads of convicts, Banks decided to do everything he could to make the experiment a success.

He was the Government's trusted consultant on all manner of things concerned with the administration of the new colony; Governors King and Bligh were appointed on his recommendation; the Flinders voyage of circumnavigation of the continent was largely his project, and many of the first explorers were friends or employees who had been inspired by his enthusiasm.

Banks could have held high office in the colony had he wished but he explained that he felt he could be of greater service as advisor to the government at home.

In the 18 years that had passed, from discovery to colonisation, Joseph Banks had reached a unique position in scientific and social circles; created Baronet in 1781, was founder of the Royal Institution, active member of the Society of Arts, the Engineers' Society, the Dilettante Society, the Society of Antiquaries and the National Institute of France. George III sought his help in the development of the Royal Botanic Gardens at Kew, and he was virtually the Director of these gardens for 47 years.

Sir Joseph maintained voluminous correspondence with Australia's first governors, who kept him well informed on important matters which they did not feel impelled to write in their official dispatches. Homeward bound ships often carried special freight for the Patron; samples of coal, strange flora like the waratah and the Norfolk Island pine, wool from John Macarthur's Spanish merinos, even live emus and black swans.

Fresh honours were bestowed upon him; Knight Commander of the Bath in 1795 and Privy Councillor in 1797.

Somewhere around 1806 an illness caused him to lose the use of his legs but his mental faculties remained unimpaired till his death, on June 19, 1820, aged 77. He left a widow but no children.

His will contained an express wish that his body be interred in the simplest possible manner, and that no monument be erected to his memory. It would be proper to respect his wish.

Where the *Endeavour* rode quietly at anchor in Botany Bay for a week in the mid-autumn of 1770, squat oil tankers now impatiently wait their turn to discharge their cargoes of crude oil for the refineries of Kurnell. Where young Isaac Smith jumped ashore, the first to land, a weathered sandstone obelisk has become a common landmark for bay fishermen who sometimes catch a few flathead but rarely a giant stingray.

Where Captain James Cook "went in the pinnace to the head of the bay" and up a small stream which later bore his name, men have diverted the stream, and "as fine a meadow as was ever seen" has been concrete covered to make longer runways for a busy airport.

But where young Joseph Banks gathered the first specimens of unique Australian flora for his world-famous collection, suburban gardeners tend their roses and mow their buffalo grass ... and show with special pride their corner for native plants, especially their specimen Red Honeysuckle, or if you like to be botanically correct *Banksia serrata*.

HISTORY

When the international competition for a design for the Australian National Capital was launched in 1911 by the Commonwealth Government, the ties of tradition were strong and the desire to copy and follow overseas fashions and trends was more evident than encouragement of innovation.

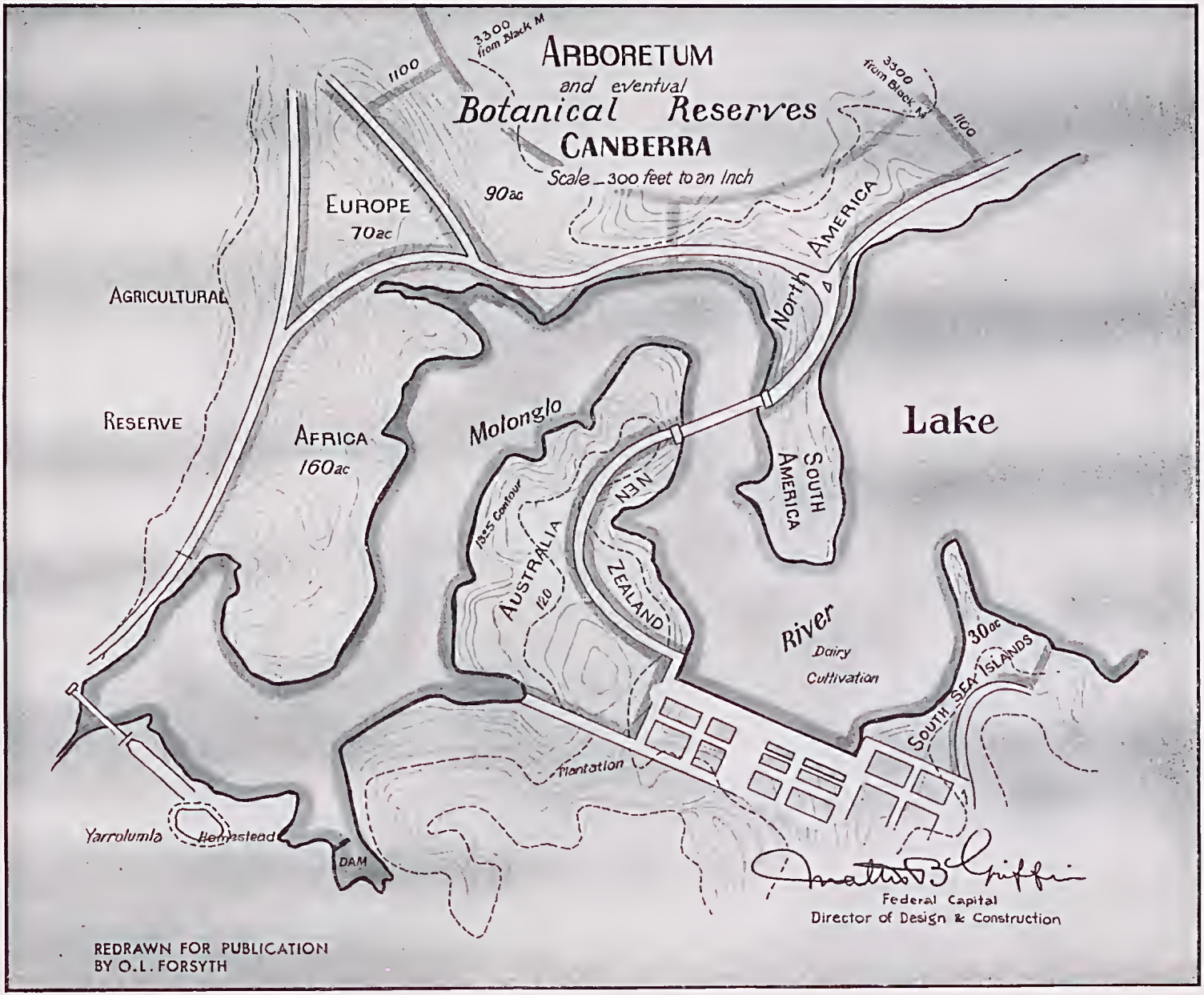
The terms of the competition advised competitors to "embody all recent developments in the science of town planning", tacitly inviting them to introduce all the latest English and American ideas in "garden city" design, so it is not surprising that nobody suggested that an area should be reserved exclusively for the cultivation and study of Australian flora.

All the plans had an abundance of formal gardens and shady parks and wide avenues lined with majestic trees both native and exotic. The successful design by Walter Burley Griffin envisaged formal gardens between Regatta Point and Aspen Island, as they are now called. In the West Lake area he mapped out a large scale Continental Arboretum, an ambitious and novel concept in which he saw wide separate areas planted with species from Europe, Africa, Asia, North America and South America on the north side, while Australia and New Zealand would be represented on what is now the Weston Park on the southern shores of the lake. For good measure, and to complete the picture, but with total disregard or contempt for Canberra's chilly winters, he nominated an area, where Stirling Park now stands, for the cultivation of specimens from the South Sea Islands.

All the area now developed or being developed as Canberra's north-western suburbs was to be forest reserves; Black Mountain was a reservoir site and scenic lookout, to remain more or less in its native state. The Botanic Gardens were to extend from the lower slopes of Black Mountain to the lake's edge "near the University".



This track winding informally through the MYRTACEAE section of the Gardens exemplifies the atmosphere of quiet relaxation and abiding interest they hold


ARBORETUM
and eventual
Botanical Reserves
CANBERRA
Scale 300 feet to an Inch
3300 from Black M
1100
3300 from Black A
1100
90ac
EUROPE
70ac
AGRICULTURAL
RESERVE
AFRICA
160ac
Molonglo
NORTH AMERICA
SOUTH AMERICA
NEW ZEALAND
AUSTRALIA
1925 Contour
120
Lake
River
Dairy
Cultivation
30ac
SOUTH SEA ISLANDS
Plantation
Yarrolumla
Homestead
DAM
Federal Capital
Director of Design & Construction
REDRAWN FOR PUBLICATION
BY O.L. FORSYTH

84 William Street,
Melbourne.
18th December, 1915.

Mr. Edwin Cheel,
Botanical Gardens,
Sydney.

Dear Mr. Cheel,

I have forwarded by post a drawing showing areas set aside at Canberra for Botanical Reserve following your suggestion of Geographical classification, and I should be glad of your advice thereon and will try to forward you such further information as you may request.

In general the whole immediate region to the east of a north and south line through Black Mountain is of silurian formation of which Blakc Mountain is an isolated sandstone Monadnock 900 feet high the remainder being shales without much alluvium. Immediately to the west of this assumed meridian the geological formation is massive quartz porphyry, but the principal part, at least, of this Reserve lies over the former, the soil immediately around the mountain, of course, being more or less sandy.

Yours truly,

W. B. Griffin

Federal Capital Director
of Design and Construction.

P.S.
The areas indicated are practically devoid of tree growth now.
WBG

When describing this area in his "Report Explanatory of the Preliminary General Plan" (October 1913) Griffin made a bitter comment which has endeared him to nature lovers ever since. In a plea that part of this reserve should be protected from any alteration, his closing comment was: "... perpetuating there the only remnant of primeval luxuriance on the city site."

It was not for Burley Griffin, an American, to intrude any suggestion that Australians should be more concerned about the study and cultivation of their unique flora by the establishment of a national garden of Australian plants, but he left the poignant hint that it would not be incompatible for inclusion in his vision of the city beautiful.

It was intended from the beginning that Canberra should be a garden city, and in anticipation of future needs a nursery was established in 1911 on three acres of sandy alluvial soil on the western slope of Acton Peninsula, where Canberra Hospital now stands. In the first year more than 4,000 seedling trees, shrubs and smaller plants, mostly exotics, were planted. Thousands more went in with each succeeding year and the nursery was enlarged to 10 acres.

In May 1913 a new nursery of 400 acres was marked out at Yarralumla, and by 1914 the Superintendent of Nurseries, T. C. Weston, reported that some 12,400 trees had been planted immediately to the north of the brickworks, and that Acton nurseries had raised some 70,000 seedlings which had been transplanted to open nurseries "for future requirements".

Weston was concerned that so much of the early planting had been almost exclusively of exotica, and an appeal was made to J. H. Maiden, Director of Sydney Botanic Gardens, for a supply of "such native trees and shrubs as are likely to prove suitable for the climate of the proposed Federal Capital". Mr. Maiden, a world authority on eucalypts, sent 1,300 miscellaneous plants, many of them exotic, because it was his opinion that if the nurseries were to confine their efforts to the growing of "native plants suitable to the district, they would be very bare for the next five years".

In October 1912, Mr. C. R. Scrivener, Director of Commonwealth Lands and Surveys, anticipating an early decision on the design of the city and the location of its principal features, recommended that Mr. Weston should prepare to devote "his whole energies in the direction of planting within the Federal area, especially in the areas about the principal buildings".

In 1913 work began and while the first roads were being marked out and the first excavations were being made on the building sites, Mr. Weston's gardeners were planting the first trees.

In December 1915, Burley Griffin, then Federal Capital Director of Design & Construction, appointed to supervise the working out of his own design, indicated his keen interest in the planting of Australian trees in a note to Weston, in which he asked Weston to make sure that seeds of *Syncarpia laurifolia* "are obtained from specially hardy trees, say in the Blue Mountains at our altitude".

Through the four years of World War I, although developmental work was slower than it might otherwise have been, the tree planting programme went ahead.

Burley Griffin became more and more interested in the use of Australian native material but his enthusiasm must have been severely dampened after a visit by botanical advisor Maiden from July 15–20, 1919, to examine Griffin's tree planting proposals.

Mr. Maiden made a seven-page report to the Surveyor-General in which he gave high praise to Weston, but a forthright snub to Griffin in invective that deserves quotation for its elegance:

"No one impugns the ability of the Federal Director of Design and Construction in regard to matters of architecture and its related engineering problems, but problems affecting planting in Australia, in which Australian indigenous species are concerned, and also questions of meteorology, drainage and soil, in so far as they affect plant welfare, belong to a different category.

"In Europe and America, with centuries of experience to draw upon, with deciduous trees and long periods of winter-rest, architects are in a very different position, as regards plant data, to Australian architects. The Director of Design & Construction, in addition to his many accomplishments, has not yet had time and perhaps opportunity to obtain more than a superficial knowledge of Australian plants, their requirements and acclimatisation, and therefore work of that kind should, in my view, be placed in the hands of a man whose knowledge and experience will reduce the anxiety of the Government to a minimum.

"No one expects the Director of Design to be responsible for the choice of trees and other subjects, and public opinion would not apportion blame to him in the case of failure if it were shown that the Government insisted on him carrying out a duty which it would be unfair to impose on him.



Acacia baileyana, Cootamundra Wattle, has naturalised itself over many parts of N.S.W. and the A.C.T.

"The Director of Design is to be commended for his desire to cultivate native trees, but his sentiment must not be translated into actual practice. The list that he submits is inadequate and even erroneous as a whole, and the adoption of it can only result in disaster. The Officer in Charge of Afforestation can make a far better selection, and I recommend that he be instructed to push on with the planting . . . and I suggest that he be not given too many detailed instructions.

"My recommendation implies no disloyalty to the beautiful design of the Director of Federal Capital Design & Construction . . . I want our Federal city to be one of the most beautiful in the world, and I do not wish to hinder this by bungling the planting."

If ever Burley Griffin had thought of extending his plan to include a National Garden of Australian Flora, it probably vanished in July 1919.

We must look elsewhere and a long time later for the initiator.



Hakea laurina, Pincushion Hakea, one of the most beautiful of this attractive group

From then to 1927 development was focused on the essential work of building a temporary Parliament House and on providing offices and housing for the first contingent of public servants involved in the transfer of Parliament from Melbourne.

When visitors arrived for the Opening of Parliament in 1927, Canberra's main avenues were tree lined, many of the conifers were 16 years old; the parks had their poplars and oaks and chinese elms contrasting against the background of native eucalypts and acacias. It was commented that Canberra was already "one vast botanic garden, lacking only Latin labels on the trees".

The concept of a Continental Arboretum had been gently put aside and the area where the Botanic Gardens would be developed some day was under lease to dairy farmers. The cattle grazed on Burley Griffin's "only remnant of primeval luxuriance on the city site" and nobody seemed to care.

But in July 1933 a recommendation to the Minister for the Interior from the Advisory Council showed that a number of local enthusiasts felt that the time had come for action. It was unanimously recommended, on the motion of Councillor T. M. Shakespeare *"that a start be made with laying out portion of the site set apart for Botanical Gardens and of planting same with native and exotic trees, shrubs and plants of economic and medicinal value as distinct from those grown for ornamental purposes only"*.

A reply came, after many delays and proddings, that Dr. B. T. Dickson, Chief of the Division of Plant Industry of C.S. & I.R., had been co-opted to examine the proposal and report on its feasibility and probable cost.

For more than a year Dr. Dickson and Superintendent A. E. Bruce, of Parks & Gardens Section, gathered information from botanic gardens throughout the world, and on September 4, 1935 the "Dickson Report" was presented.

Dr. Dickson went much further than the Advisory Council had suggested; he went back to Burley Griffin's original proposal, endorsing it warmly, and he specially commended the choice of the Black Mountain area.

The report went on to stress that establishment and maintenance were highly specialised operations which must be carried out by skilled persons "if the Botanic Gardens of Canberra were to be worthy of the National Capital". Dr. Dickson cited the annual costs of the Sydney, Melbourne and Adelaide Gardens but he did not venture any

estimate for Canberra. He indicated that, in his opinion, "a very large sum would be involved".

The Advisory Council was told that before any consideration of its proposal could take place a survey of the site would have to be made and costs would have to be estimated.

Down all the years it must have seemed to the enthusiasts that the fates were conspiring against them. There was never direct opposition, always agreement that Canberra should have its Botanic Gardens, but "first things first" and there was always the perfect stopper . . . "lack of finance".

At last the first step was to be taken. But before the surveyors set up their theodolites, World War II had broken out and the Botanic Gardens file went back into the locker without any need for explanation.

Up to 1944 the concept had always been seen as Botanic Gardens of the orthodox pattern, havens of quiet rest and relaxation, where students and nature lovers could see unusual and beautiful plants brought from far away places and where children could roll down grassy banks or throw bread crusts to the ducks and swans. Every capital city should have places like that, and every Australian State Capital had beautiful and distinctive Botanic Gardens, so there need be no hurry for Canberra. Indeed it can be said that only a few of Canberra's citizens were aware that botanic gardens were on the plan.

In the Advisory Council, in December 1944, a new councillor, Dr. L. W. Nott, who had recently visited Philadelphia, U.S.A., where he had been impressed by the beauty of a lilac grove, asked whether a similar feature could be arranged for Canberra. He added that he had been told by Mr. Bruce, who had recently retired as Superintendent of Parks & Gardens that the proposed botanic gardens were to be "of educational value and therefore they would not be a suitable location for a lilac grove".

The representative of Department of Interior,



Acacia adunca. This species is among the best for garden culture. It forms a large shrub up to 12 feet, with bright masses of flowers in spring



Calothamnus homalophyllus. A Western Australian species that usually has red flowers. Yellow ones like this are uncommon

Works & Services Branch, Mr. P. A. Gourgaud, replied that the nature of the gardens had not been decided but the matter was listed for consideration as a post-war project.

The new Superintendent, Lindsay Dixon Pryor, had come to Canberra in 1936, the year of the publication of the Dickson Report. As a Researcher in Forestry he made a special study of the vegetation of the Australian Capital Territory and the genetics and breeding of eucalypts. On his appointment as Superintendent of Parks & Gardens in 1944 a list of post-war projects was prepared and approved. On September 21, 1945, less than three weeks after the war in the Pacific ended, Pryor laid a claim for an immediate start on the Botanic Gardens, his number-one post-war project.

His request was moderate: definition of the boundaries, a survey and preparation of base plans, some small items of meteorological equipment, fencing the area, removal of stumps and some minor items which should cost, in all, a trifling amount; he suggested that "£1,000 could be profitably used over the next 6 months".

The Consultative Committee for Parks & Gardens approved and the way ahead seemed clear. But surveys take time, and lessees of the area for grazing their dairy cattle had to be considered, and variations of the boundaries had to be arranged, so it was not until 1951 that the order could be given to the fencing contractor.

Yet the "Parks & Gardens" had not waited for all these statutory requirements to be met. The British Commonwealth Specialist Conference in Agriculture was to meet in Canberra in September 1949 and this gave the opportunity for arousing interest at the top level. The official files give no hint of how it was arranged or wangled but a report in "Canberra Times" of September 13, 1949, headed "First Tree Planting in Botanical Garden Area" records that, "in the presence of delegates, the Prime Minister, Mr. Chifley, planted a small gum tree and Sir Edward Salisbury, Director of the Royal Botanical Gardens at Kew, London, planted a small oak".

The report went on to say that "initially the scheme will concentrate on developing Australian plants, although collections from countries with a similar climate will be included".

But the horticulturists and botanists knew that Australia's wealth of unique flora deserved and demanded the undivided attention of more experts than they could expect to enlist during the early stages of the garden's development. They elected (or maybe conspired) to defer the introduction of exotics until their work with native plants had reached a stage where this extension was desirable.

Back in the earliest days, before the terms of the competition for a design for the city were drawn up, when it was determined that Canberra would be a garden city, the advice of the curators of the Botanic Gardens in the State Capitals was sought. They responded with keen enthusiasm, giving generously of their expert knowledge and materials. This interested co-operation has continued down the years.

Each State Capital has its own Australian flora culture and study operations; other cities and towns have their special areas devoted to native species; and the interest in conservation and the protection of indigenous flora and fauna from the unhappy side-effects of industrial and economic progress is seen in the growing demand everywhere for more and more development of State and National Parks and Reservations.

The enthusiasm of their professional colleagues throughout Australia for the establishment of the Canberra gardens specifically for the study and culture of native plants convinced the planners that their decision to specialise was not only practical but entirely popular.

The transformation of Canberra, since the development of the Lake Scheme drew its diverse parts into unity and harmony, has been matched by the transformation of the attitudes towards it. From a small scattered community of pioneers, most of whom looked forward to the day when they could leave it, Canberra has become a focal point of interest for Australians and a place where the desire is to stay and participate in the work of bringing it to full maturity.

As the Capital City of a nation that is becoming more and more aware of the vast potential of its natural resources, Canberra is expected not only to reflect and symbolise the aspirations and character of the nation but to foster and encourage appreciation of those things that are uniquely Australian.

Nobody would think of asking today why Canberra had developed its Botanic Gardens exclusively for the study and culture of Australian native flora. It is so obviously fitting . . . exactly what one would expect!

Many factors contributed towards the decision to concentrate on Australiana. Before and during Dr. Pryor's fourteen-year term as Superintendent, Viennese botanist Erwin Gauba had been his close collaborator in research on the genetics of



Diuris pedunculata, a terrestrial orchid native to Black Mountain

eucalypts and on the flora indigenous to the Capital Territory. Dr. Gauba had amassed and classified a very large amount of material. The more they worked on it the more apparent it became that the detailed study of Australian flora deserved concentrated attention. The challenge was irresistible. Then there was the interest and encouragement of other workers in the field of botany and horticulture who saw great promise in the idea.

So, in 1958, when Dr. Pryor was appointed Professor of Botany in the Canberra University College, which was later to form the basis of the School of General Studies in the Australian National University, his successor as Director of Parks & Gardens, Mr. David W. Shoobridge, inherited the concept.

Mr. Shoobridge had been closely associated with Dr. Pryor for many years, having come to Canberra from Tasmania in 1940 to be an Assistant Forester. Professor Pryor held the post of Superintendent, Parks & Gardens Section, from 1939 to 1958, and also from 1940 to 1945 was Acting Forester while the permanent occupant, Mr. C. R. Cole was on war service overseas. Mr. Cole was head of the A.C.T. Forestry Section from 1929 to 1954.

Mr. Shoobridge succeeded Dr. Pryor as Director of Parks & Gardens in 1958. No process of adjustment was necessary for David Shoobridge; he had been one of the team that had envisioned the development from the beginning.

He saw that Dr. Gauba's collection was already vast and still growing at a pace that demanded the attention of another botanist to co-operate in identification and classification. Besides, Dr. Gauba was nearing retiring age and continuity was imperative.

At that time the adviser on soil conservation to the Snowy Mountains Hydro-Electric Authority was Dr. M. E. (Betty) Phillips, M.Sc. (Sydney), Ph.D. (Manchester), a botanist who had a keen interest in the Canberra project. As a small child in Heidelberg, Melbourne, she had lived next door to the original planner, Walter Burley Griffin, so Canberra had been in her thoughts right along.

Dr. Phillips took up duty in June 1960, succeeding Dr. Gauba who continued to give some of his time to his precious collection long after his retirement.

By 1964 many additions to staff had been made, the herbarium had been moved from a wooden building in Acton to a brick cottage in Downer and planting and landscaping was transforming the gardens on Black Mountain.



Lake McKenzie at the Jervis Bay Annexe to the Gardens

Botanists, like most dedicated researchers, are happiest when their concentrated interest is not in danger of being interrupted by having to explain to others what they are doing. To add to knowledge is the important thing, not to make a show or demonstration of the way they go about their work.

They like to know that their work is appreciated as essential to progress, but they count themselves fortunate that a botanist's work is not so spectacular that it draws crowds of onlookers.

On the other hand, the horticulturist knows very well that while his work is another aspect of the search for knowledge in the same field, his living garden will draw the attention of many more people than those who are interested in its scientific purpose, the thousands who are attracted by the magical charm of a luxuriant garden.

In its early formative years, while plants are becoming established, a garden holds little interest for any but the horticulturists themselves, the botanists and people with more than ordinary understanding of the purpose and the problems. This quiet development period has its advantages and during this time publicity is almost avoided so that public interest will not be deliberately aroused.

By 1966 the early plantings by Lindsay Pryor had grown to substantial size and maturity. The sorties he had made into the countryside collecting

seeds and small plants proved rewarding. Collecting trips by Dr. Phillips and other members of the botanical and horticultural staffs added thousands of specimens for the herbarium and the gardens, from as far away as Western Australia and Tasmania. The development went on behind closed gates. Construction of paths, bridges, rock work and other features could have been seriously hampered if visitors were admitted and tourist buses were to unload their passengers by the hundred on the daily sightseeing tours.

After all, these were not orthodox botanic gardens, they were primarily intended for specialist study. In Canberra there were many beautiful parks specially planned for quiet relaxation and refreshment and family picnics; the botanic gardens could serve their purpose far better if they were not expected to provide fair-ground entertainment facilities.

Towards the end of 1966 progress had reached the stage that required the engagement of a skilled arboriculturist to give his time exclusively to the horticultural development of the gardens, and a New Zealand scientist, Dr. Ross G. Robbins was appointed.

Early in 1967, Dr. Robbins indicated that he would wish to leave in June to take up an appointment to the Chair of Botany in the newly established University of Papua-New Guinea, so Mr. John W. Wrigley, B.Sc. (Sydney) whose interest in, and knowledge of, native flora was well known by his work on the establishment of the now well known Ku-ring-gai Wildflower Garden at St. Ives, near Sydney, was invited to work with Dr. Robbins and succeed to the position of Curator in June 1967.

These appointments were noticed by the press, radio and television and public interest mounted rapidly. It was so great that, although there was still much work to be done on landscaping to restore the area after the disturbance created by the extensive drainage and water-feature excavation, it was decided to open the gardens for public inspection for eight hours daily from September 27, 1967.

Much still remained to be done, however, before work was sufficiently advanced to warrant an official opening. But when the Australian Institute of Parks and Recreation indicated that arrangements were being made for the 1970 International Congress of Parks Administrators to be held in Canberra, it was decided to press on with the work and endeavour to have the gardens ready for formal opening during the conference.

When we see what has already been achieved, and the mind's eye can envision future progress, and when we compare what we have with what might have been, we should be thankful for the delays and frustrations of earlier times.

Had development gone according to plan, Canberra's Botanic Gardens would have been beautiful: Walter Burley Griffin, the ardent nature-lover and pupil of the great Frank Lloyd Wright, would have seen to that. But they would have been no more than a variation of the orthodox pattern of botanic gardens perhaps with the concession of having the "Australiana" section unobtrusively prominent near ornate wrought iron gates.

Those cautious "keepers of the purse" who saw no need for haste were true benefactors. They and those frustrated enthusiasts who pressed and urged in vain are now to be be remembered with gratitude and affection. Their memorial, Canberra Botanic Gardens, is more appropriate than was ever dreamt of in their philosophy.



Acacia implexa, known as Hickory Wattle

THE BOTANISTS

Man's interest in plants is fundamental and wide ranging. Directly and indirectly plants provide nearly all his food, much of his clothing, shelter and other basic physical needs, and they contribute greatly towards his pleasures and his aesthetic satisfaction.

Yet while many plants yield elements for man's benefit, to promote his health and heal his wounds, others seem to have been designed by some perverse caprice of nature to inflict pain on him, and even deadly harm.

So thought primitive man, who learned by hard experience to distinguish, and to cherish or avoid.

But when systematic study replaced crude trial and error, the "deadly nightshade" of the Middle Ages became the source of atropine for modern medicine; Iago's "poppy and mandragora" and the "hemlock" that destroyed Socrates now yield their sedatives for pain relief, and the deadly curare gum that tipped the poison arrows of Amazonian Indians is a muscle-relaxing agent in modern surgery. The botanist and the chemist in collaboration unlock the secrets hidden in plants by nature from the beginning of time.

The chemists, the physicists and the mathematicians, by their discoveries in molecular construction, have made possible the production, in quantity, of synthetic equivalents of valuable materials that can be extracted only with difficulty or in small amounts from plants . . . while the botanists continue the search for the basic information, which only the plants themselves can supply.

After prehistoric man first began to cultivate, he learned to select and save the best seed of his growing for following sowings. Thousands of years later, when he had begun to practise the art of drawing to depict his contemporary scene, the plants he sketched were shown to be carrying more and bigger ears of grain than those of the wild varieties from which they had been encouraged to evolve. The principles were sound though the progress was slow.

Today the plant breeder, with his knowledge of plant genetics, is able to produce within a few generations new varieties of food grains to meet the special needs of food processors, and to breed plants with characteristics which enable them to grow and thrive under various conditions of soil and climate. This aspect of the task of meeting the food needs of an expanding world



Pterostylis decurva, the "Summer Greenhood", is another of the wide range of native terrestrial orchids

population calls for the co-operation of many sciences, and not the least of these is botany.

Early man was well-provided by nature with many edible fruits . . . for instance, the berries and nuts of the cooler regions, the dates and figs of warmer climes, the breadfruit, bananas, pineapples and coconuts of the tropics. These and many others have changed little down the centuries. But a lot of the choicest fruits of today . . . many varieties of apples, pears and peaches, the nectarine, the apricot and the navel orange, to mention only a few . . . are the product of scientific principles enunciated by the botanist.

And for man's aesthetic enjoyment the world holds a seemingly infinite number of plants that delight the senses. Tall trees in a wild landscape, golden wattles in bloom on a hill, the symmetry of tiny fronds of fern, the tang of the eucalypt, the fragrance of boronia; these are things best left just as they are, even if some enterprising mind conceived the vain idea that science might make some improvement.



Stylidium graminifolium, the grass-leafed trigger plant, is common in the Eastern States. A useful and interesting plant for rockery use

But then we see a garden of roses, a blazing bed of massed salvia, chrysanthemums and camellias on show benches, hot-house displays of begonias and cineraria . . . and we reflect that all of these and a thousand more had humble origins in far less attractive form. The transformation is the result of patient application by inspired horticulturists of the methods devised and perfected by the collaborator, the botanist. And we wonder what magic will be performed when the studies are applied with greater intensity to some of Australia's native plants.

So we turn to the botanists in the Herbarium of the Canberra Botanic Gardens to learn of plans and progress in their special field. The story from here is as the botanists tell it.

The first aim of the botanist is to collect, identify and preserve in proper scientific arrangement, dried specimens of all Australian flora together with appropriate records which may be available for study by all who are qualified and interested.

The Herbarium at present holds more than 30,000 specimens of dried plant material. Living specimens of as many of these species as will grow in the Canberra Botanic Gardens are either established, being propagated, or are on the list for propagation experiment.

On collecting trips to areas likely to yield new material botanists may be accompanied by horticulturists. The botanists do preliminary pressing of their specimens destined for the herbarium, while the horticulturists pack and send to Canberra by the quickest possible means (air freight when available) living specimens of the same material.

The herbarium specimens arrive as dried pieces enclosed in newspaper folders . . . (in the Botany Bay tradition). At this stage identification work is done with the aid of published accounts of the flora of various States and smaller areas, and by comparison with specimens already in herbaria. After naming, they are mounted, labelled and enclosed in folders for placement on the herbarium shelves in taxonomic arrangement.

The identifications are also passed on to the horticultural staff so that the correct names can be put on the young plants in the propagation section.

To make the identification of garden material absolutely certain, there is a precise system of cross-reference. A plant growing in the garden carries at the upper end of its label its "propagation number". A dried specimen of the material originally collected will be found in the herbarium with the same "propagation number". Conversely, it should be possible to tell whether any propagating material was brought in with a particular herbarium specimen, whether this survived and, if so, where it may be seen in the garden.

A team of about eight people is involved in the collection and identification of specimens; all of them have botanical training, some at a high professional level. Other teams are concerned with the physical care of specimens . . . drying, mounting and maintaining correct positioning in the collection.

To display the plants with scientific accuracy, a continual check must be kept on specimens growing in the garden. A "stocktake team" of about half a dozen people responsible to the botanist has to prepare sketch maps showing the location of specimens in each section. A section will contain related plants, some of which may have been planted fifteen or more years ago, while others will have been propagated from material brought in by recent collection teams.

The botanist then checks the maps as an



Two views of *Caladenia congesta*, a species that occurs rarely within the Gardens area and sparsely on Black Mountain

insurance against error and to transfer determinations which may have taken some time (perhaps because specimen material has been sent to some other herbarium for discussion). The botanist indicates which specimens have been identified with absolute certainty and can now have permanent labels attached. These labels, of laminated plastic plate, are then machine-engraved and put in place by members of the stocktake team. The basis for study is established.

The scientific study of Australian flora began only 200 years ago with the Banks collection. In other parts of the world the flora of various countries was already well known. There were botanic gardens of a sort at Ninevah in Assyrian times, and one the Aztecs created near where Mexico City now stands. Through the Middle Ages, many botanic gardens were maintained in Europe: one of the best known, the garden at Leiden in Holland, still exists.

Those ancient gardens were a vital part of the life of the times, since most of the medicaments used for maintaining health were derived from plants . . . mainly herbs.

But the aboriginal people of Australia, isolated from the rest of the world for countless centuries, had not become gardeners. Any contact with the outside world was limited to visits by other native peoples from the islands to the north and these were mainly fisher folk and not agriculturists themselves.

Tribal lore, handed down by word of mouth and example, passed on from father to son a vast store of knowledge about the uses and qualities of their unique Australian plants, but early settlers and the first botanists to take up the study found difficulty in extracting information from the native people and learned more by observation than communication.

The Australian botanist had a whole continent of unique plant material to explore, examine and classify. Through the processes of evolution in isolation, since the continents drifted apart millions of years ago, and the land bridges disappeared under the sea, Australia has developed a flora with a high proportion of endemics . . . species or genera which occur in no other place.

Because of variations in habitat there are some very narrow endemics; for instance, a whole group of species which occur only in Tasmania; another group found only on Kangaroo Island, and a few which are confined to some particular site, such as *Bauera sessiliflora* which occurs only in the Grampians, *Grevillea laurifolia* which is found only in the Blue Mountains, and a species of *Restio* which has been found only in a single swamp on the Southern Tablelands of N.S.W.

In a country where rapid development is taking place, care has to be taken to preserve native species from extinction and it is sadly true that in some instances this is a real danger in Australia.

Some may have already disappeared since civilised man appeared on the scene. How close to extinction some species have gone can be appreciated when the visitor to the Canberra Botanic Gardens is shown two thriving tiny plants and is told that only three of its kind are left growing in the wild, on a private property in Western Australia, where, fortunately, the owner is treasuring them.

Another example is pointed out . . . a plant which grows just north of Gosford where less than a dozen can now be found. But besides the specimens in the Canberra Gardens, others are now being propagated by a private nursery specialising in native plants.

The Flannel Flower (*Actinotus helianthi*) and the Native Rose (*Boronia serrulata*) which grow wild only around Sydney on the Hawkesbury sandstone, once grew in profusion where wide areas are now covered with suburban homes. The species will be saved from extinction by Botanic Gardens and private horticulturists now cultivating them, but the glory has departed.

For many reasons it is urgent to obtain as much information as possible about Australia's scientifically interesting and beautiful plants, a fact that is appreciated by those who have stopped to think of the importance of this knowledge to Australia's economic development, its cultural advancement, and even the country's individual character.

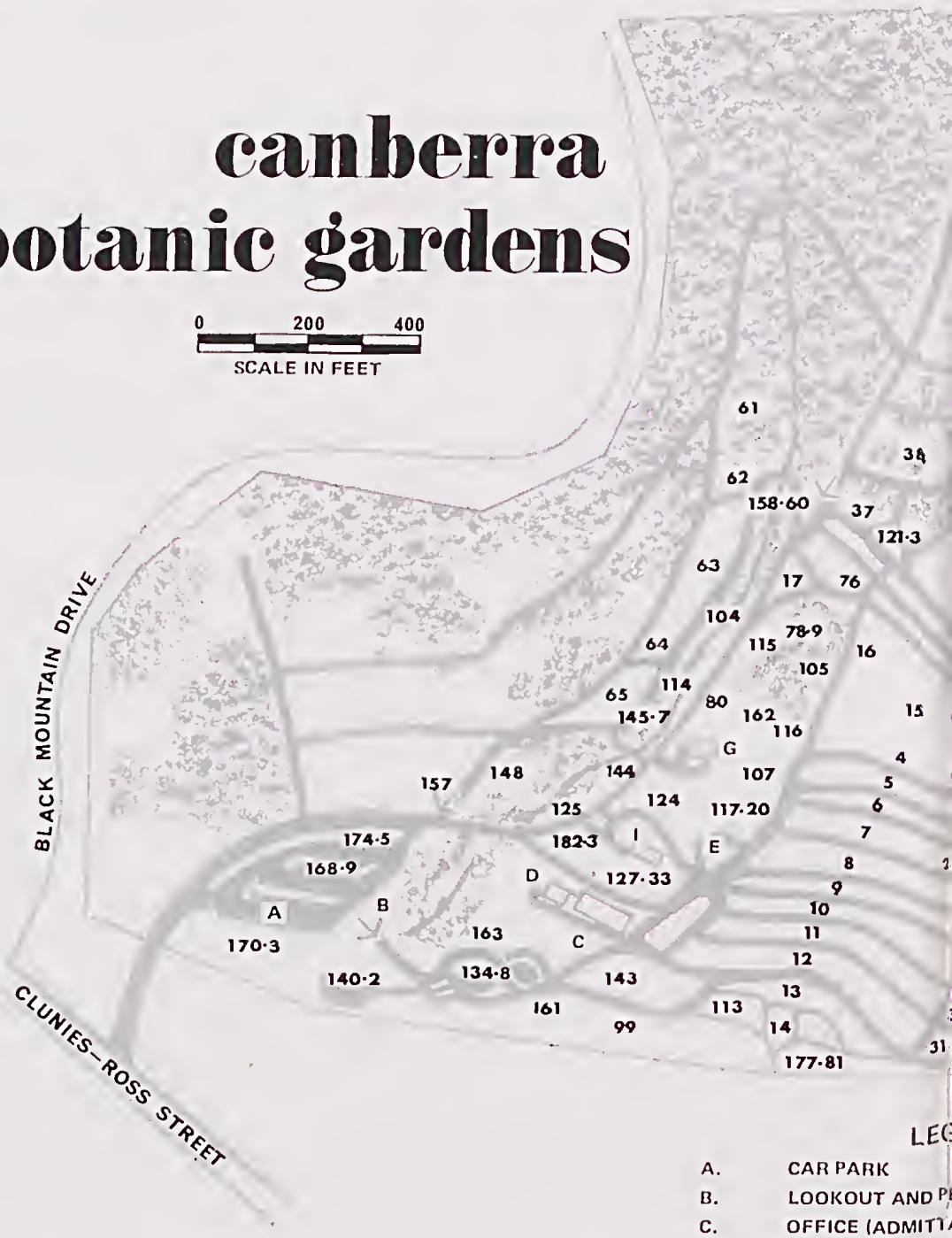
Very early in the history of the Australian States, active centres of systematic botany were established and the work of herbaria of Brisbane, Sydney, Melbourne and Adelaide, which are located in and part of their Botanical Gardens, is widely recognised. Western Australia and Tasmania have their herbaria too, and all of them have made, and are making, considerable contributions to knowledge, especially in relation to their own flora.

Exchange of information between Canberra and the various States herbaria is a routine function, and co-operation with collecting teams in the field is normal experience, as would be expected of enthusiasts working with a common aim.



A massed display of native annuals. Development work on Australian annuals is proceeding rapidly at the Gardens

canberra botanic gardens





Numbers refer to the location of plant groups

END

DESTRIAN ENTRANCE
NCE TO ENQUIRY DESK ONLY)

E. PUBLIC TOILETS
F. SHADE HOUSE
G. CURATOR'S COTTAGE
H. GARDENER'S COTTAGE
I. DEPOT.

HORTICULTURE

As one third of the Australian continent lies within the tropics, and a vast area of the inland within the temperate zone is desert, or nearly so, it might be imagined that only a small proportion of Australia's native flora could be induced to grow in Canberra where night temperatures in winter drop below freezing, sometimes for weeks on end. But that is not so.

Canberra's average annual rainfall is less than 26 inches but evaporation is almost double that amount, making it a relatively dry area, comparable with much of inland Australia. The dry inland, even in desert areas, though hot by day can be very cold at night. Its flora, with some challenging exceptions, can be grown quite well in selected areas of the Canberra Botanic Gardens.

On the other hand, a deep natural gully up the side of Black Mountain has been transformed into a rain-forest where minimum mid-winter temperatures at the bottom of the gully are between 10 and 15 degrees higher than at the top. With an intermittent and controlled misting system creating simulated rain-forest conditions, many humidity-loving plants previously regarded as unlikely subjects for outdoor cultivation in Canberra are thriving.

Under a canopy of tall eucalypts ... some of them native specimens many years old ... tree ferns (*Dicksonia antarctica*) and many other species of fern planted within the last few years are so well established that they have begun to propagate on their own account. Staghorns and elkhorns have almost hidden the wires they no longer depend on for support high up tree boles.

Epiphytic orchids from Northern New South Wales clinging to tree branches and trunks have shown their satisfaction with the environment by flowering within 18 months of their attachment.

Elsewhere in the Gardens, from the high ridges to the lower gentle slopes and in sheltered and open situations, there are significant differences in winter minimum temperatures, so, by siting plants according to their sensitivity to cold, many more species can be added to the collection than would have been possible in almost any other locality in Canberra.

Here, the lovely Western Australian blue Lechenaultia (*L. biloba*) is thriving; in Canberra in general it is killed out in winter. The unique Kangaroo Paw, always thought to be a difficult subject away from its Western Australian home environment, is flourishing.

Successes like these encourage continued experiment with what would have been regarded not so long ago as "impossible" or, at best, unlikely subjects.

For that reason, unless a collecting trip is being made into a region where all the flora is definitely known to be right outside the range of propagation in Canberra or at the Coastal Annexe at Jervis Bay, the collection team will include horticulturists as well as botanists. Although no collection of living material has yet been made north of the tropic of Capricorn, this is mainly because so much has yet to be done closer to hand.

As with the botanist in the field, the horticulturist has to be precise in recording all relevant data about specimens.

Each piece of living material gathered is labelled with its name and "field number". In his field notebook, alongside the corresponding number, the horticulturist describes the plant, its height and the nature of its growth, the colour of its flower, the type of terrain and soil conditions, its floral neighbours, and any other significant information that could help endemic study, or assist the propagators in choosing the best methods of treatment and eventual garden placement.

Immediately on arrival in Canberra, each piece of material is given a register number so that at any time, in the propagation house or in the garden, reference to the label number will give access to the record of the plant's life history.

When a trip yields thousands of specimens ... one to Western Australia in 1968 gathered over 8,000 ... much work has to be done by the botanists before final and positive identification can be made. Meanwhile, the living material will have been propagated; some, or all of it might have gone out into the garden. Wherever it is, its label will indicate whether its identification is provisional or confirmed.

Sometimes, if material has been gathered from a plant that was not in flower, two or more years might go by before the garden specimen comes into flower and enables exact identification to be made.

Cuttings taken on long field trips are immediately wrapped in wet newspaper and placed in the refrigerator carried by one of the vehicles; not to freeze them but to keep them comfortably cool and moist.

The Rain-Forest Gully



Whenever practicable, cuttings and living material are taken to an airport within a few days of gathering, are then placed in plastic-lined boxes and freighted off.

On arrival at the Gardens they are unwrapped immediately and again go into cool storage until they can be dealt with. Soft cuttings are potted first, harder material is left till last.

The potting containers are 4" × 4" plastic pots. These are filled with a mixture of perlite, Irish peatmoss and coarse river sand in equal parts, which is then pressed down about ½" by using a neatly fitting wooden block. Up to 25 cuttings (depending on their size) are placed in each punnet and are immediately watered with a watering can.

The punnets then go into the Propagation House to be about an inch deep in a 4" bed of sand and peatmoss which lies on a ½" bed of river gravel. The gravel lies on aluminium foil, covering a fibro-cement sheet, supported by a wooden frame standing 3' 6" from the concrete floor. Through the gravel five rows of heating cable are embedded to give thermostatically controlled bottom-heat at about 70° F.

The Propagation House is 20' × 30', with brick walls up to 3' then a wooden frame. The walls are covered with Nylex clear Wavelock plastic. The skillion roof is lined with similar plastic and is covered with corrugated fibre glass. The benches are 2' 7" wide.

Glass louvres above the benches and an exhaust fan provide ventilation. During summer, a leak-hose trickles a steady stream across the corrugated roof to maintain even temperature.

Watering is done by hand with a fine spray from a hose twice a day . . . up to four times a day in summer . . . enough to keep the cuttings moist but not wet.

When cuttings show signs of having rooted, those with well-developed root systems are "potted on" into 3" diameter earthenware pots. Any with under-developed root systems are returned to the container and go back to the Propagation House. If a cutting has rotted and the species is valuable it may be recut and returned to the punnet.

The medium for potting consists of 5% fine sandy soil brought from a coastal heath community on old sand dunes close to the sea near Jervis Bay where the Gardens' Coastal Annexe is established on an area of 193 acres, 50ft. above sea level. This soil is mixed with 25% Bowral peatmoss and 70% washed river sand. A balanced fertilizer mixture is added and the whole medium is steralised prior to use.

Half an inch depth of washed river gravel is placed in the bottom of each pot for drainage and the pot is filled with the medium. One rooted cutting only is placed in a pot.

The pots then go into cold frames situated under a shade house roofed with 64% sarlon shade cloth. The frames have removable wavelock plastic covers which may be closed as protection from wind, heavy rain or frost, or they may be opened to various angles to suit prevailing climatic conditions. During winter the covers are closed at night, with an extra cover of hessian and aluminium foil.

Watering is done by hand with a fine spray to keep the soil moist but not soggy.

The plants remain in the 3" pots until they have developed good root systems (determined by tapping out the contents for observation) and are then potted-on into 9" × 9" square black plastic bags which have been part filled with potting mixture.

Care is taken not to disturb the roots when potting-on and the extra soil added to fill the extra space is packed down gently but firmly to within ¼" of the top of the bag.

The plastic bagged plants then go into sub-irrigation bays, where they rest on steel mesh at least an inch above the floor of the bays to allow them to drain freely. The bays are flooded to half way up the bags and the water entering the bags through their base perforations rises by capillary action to the top of the soil in the bags. As soon as water is seen on the surface of all the bags the drain plugs of the bay are removed. Because the bags are on the raised mesh the bays drain quickly and the free water in the bags escapes effectively.

The whole watering process takes less than two hours and is necessary only once a day in summer, less often in spring and autumn, and not at all in winter. If winter rains do not provide sufficient moisture, supplementary watering is given with a hand held hose.

Sub-irrigation has many advantages. It takes guess work out of the amount of water a plant receives; it ensures that all plants receive uniform watering, and it encourages downward growth of the root systems instead of concentration of roots near the surface, as can easily happen with overhead watering.

From species difficult to propagate from the cuttings, and for seed germination, different techniques and devices are used. Lighting

operated by time clocks to simulate different day-lengths, temperature control in propagating rooms and humidity control by automatic misting systems are all part of the routine.

The foregoing outline of some propagation methods is given to indicate that, while many native plants are fairly easy to handle once they have been established in the garden, there is more to successful propagation than is usually the case with well-known garden subjects that have been tamed and domesticated over hundreds of generations.

Collectors in the field take cuttings because these will propagate true to form and their propagation is less subject to the hazards of disease attack than raising from seeds. Except in the case of annuals which must be raised from seed, seed is the propagator's second choice. Transplants, of most genera, are a last resort because of the great uncertainty of success and, if the plant is rare, the horticulturist's unwillingness to contribute to the extinction of the species.

Some genera, for example orchids and Liliaceae, have to be transplanted when no seed is available. Rhizome cutting and bulb division by experts will leave the parent plant unharmed.

Each species of plant has the type of seed best suited to mature and germinate in its own particular native environment. In areas affected by long periods of drought many plants have seeds which can withstand long periods of dryness and then germinate rapidly after rain. In other areas, where bushfires are prevalent, some plants may carry their seed for months, even years, until fire sweeps through to char the seed cases so letting moisture in to activate the embryo. Many plants native to moist areas produce seed which is viable for only a short time after maturity. The horticulturist has to know these peculiarities to create the conditions required in the propagation houses.

Similarly, in the gardens, where the natural soil does not meet a plant's requirements, suitable soils must be introduced or manufactured.

A group of plants found growing in a well-drained sandy situation in Western Australia provided a problem which was solved by the construction of a bed of coarse river sand topped with grey coastal sand.

Planting out is done in September and April to avoid the extremes of summer and winter temperatures. The whole garden is fertilised with blood and bone twice a year ... in August and February. No artificial fertilisers are normally used.

In the Australian bush, shrubs usually grow close together so that the sun rarely beats directly down on the soil. Furthermore, the soil usually has a top cover of leaf litter, forming a protective mat which helps to retain moisture and to maintain equable soil temperature around roots near the surface.



Melaleuca wilsonii, a hardy low shrub which flowers well in late spring. Many Melaleucas make successful garden subjects. Prepared mulch can be seen in the top picture.

An effective substitute for the natural leaf litter is the specially prepared mulch supplied by Parks & Gardens Branch. In its programme of pruning thousands of trees in city and suburban Canberra, many tons of branches and leafy material are put through a chipping machine and are reduced to shreds. Much of this material goes on to the city flower gardens but the Botanic Gardens gets a share. Beds are mulched by strewing the material to a depth of up to four inches. It settles down gradually, and natural processes eventually convert it into mould. The gardeners top-up or replace the mulch as required usually at about two-yearly intervals.

In planting out, the normal gardening practice of providing adequate water immediately is always followed, but established areas are watered only in late afternoon, night and early morning. Not only are these the best times because evaporation losses are reduced but there would be, to visitors, a blatant artificiality about a set of sprinklers whirring in a native garden . . . and, of course, there is the comfort of the visitors as a bonus.

The watering system is operated automatically according to timing programmes adjusted weekly, each garden getting its timed ration. This can be over-ruled, if rain occurs, simply by switching off.

Some species of plants naturally growing in rock-crevices alongside a cascade or trickle of water must be given similar conditions in the Gardens, and some pond plants need moving water to keep them comfortable and thrifty. Where this would result in waste if the water were allowed to flow away, recycling pumps are installed. This has the added advantage of retaining the minute life forms which naturally develop in the ponds and are part of the normal environment of pond flora.

The simulation of natural conditions has been highly successful in most instances, but there are still many plants which are considered "tricky" or "difficult" and an important part of the work is to discover why and then to devise appropriate treatment. This work is going on all the time.

Parks & Gardens Branch has been doing this sort of experimental inquiry and testing for more than 50 years, so that a great many species of Australian flora besides those native to the area are well represented in the general Canberra floral landscape.

The most notable of these, perhaps, are the eucalypts and acacias, originally raised in the Yarralumla Nurseries, now important features fairly evenly balanced against the exotic species brought from overseas countries. As a point of interest, over the years Parks & Gardens have planted more than four million trees and shrubs in the Canberra area, and the annual out-turn is now over 100,000 woody plants.

The close link between the Botanic Gardens and the Parks & Gardens Branch has many benefits. The Gardens supplies the Nurseries with seeds and cuttings of Australian plants for use in the beautification of the city. Although the Botanic Gardens does not seek any exotic plant material, the Nurseries do and seed obtained from exchange with overseas Botanic Gardens is thus used by the Parks & Gardens plant introduction section.

Experimenting with the "difficult" species is concurrent with experiment in hybridisation, with the aim of introducing more species amenable to cultivation for domestic and public uses.

The use of native plants in Australian home gardens has not been neglected. For many years the acacias, boronias, staghorns, ferns of many kinds, and the N.S.W. Christmas Bush (to name a few) have been garden favourites. More recently, expert professional nurserymen have propagated a very wide range of native plants, improved considerably by scientific selection and breeding.

The trend towards a greater use of native plants has been due, principally, to better understanding of their needs in the garden. In the past, more were killed by kindness than neglect.

To help home gardeners, the Canberra Botanic Gardens has published a series of leaflets explaining the recommended treatment for specific species. These leaflets "Growing Native Plants" are available on application.

Visitors to the Gardens who see so many beautiful species, apparently thriving without effort, will be inspired to try a hand at it themselves, or to try again if they have failed with earlier attempts. The horticulturists of the Canberra Botanic Gardens can offer sound advice: unless the subject is one which is known to germinate or propagate easily, it is safest to buy plants from a reputable nurseryman; learn about the plant's special needs for successful cultivation beforehand and, most importantly, don't be tempted to dig up a plant in some bush setting, on the off-chance that it might grow in the home garden . . . that is something expert horticulturists never do except as a last resort . . . and they have all the equipment and a lot of know-how.

If you should ask one of the gardeners in the Canberra Botanic Gardens the secret of growing native plants he will surely reply that it is all a matter of co-operation: co-operation with nature.



Banksia ericifolia. A beautiful East Coast Banksia

THE GARDENS

The "Dickson Report" of 1935 recommended the development of about 300 acres of the lower slopes of Black Mountain taking in the whole of Black Mountain Peninsula. This was part of the 800 acres proposed by Burley Griffin as the site of an arboretum and botanical gardens. Dr. Dickson had in mind gardens where many if not most of the specimens would be exotics and where large areas would be set aside for recreational purposes.

In 1945, when Superintendent Lindsay Pryor asked for the definition of boundaries, the idea of a wholly Australian garden was firmly indicated. He saw that a wider range of climatic conditions to meet the needs of a greater variety of plants would be found, or developed, if the Gardens were located further up the mountain slope and had an altitude difference of 375 feet instead of the 175 proposed by Dr. Dickson, so he expressed his preference for a smaller area of 266 acres, but taking in two deep gullies which Dr. Dickson had seen as a problem for landscapers. The larger of these gullies is now the remarkable Rain Forest and the smaller is marked down for future development.

When planting began, in 1949, care was taken not to disturb a number of fine eucalypts, including some mature and picturesque white-barked *Eucalyptus mannifera* sub-species *maculosa*.

This species is well known as one of the most attractive trees for ornamental purposes; its clean white trunk, which changes to a bright pink in late spring just before it sheds its bark, makes it a handsome specimen. Its wide crown spread gives valuable shade, a matter of importance in those areas of the gardens where shrubs and small plants needing that sort of protection are to be located.

The Gardens now contain more than 200 of the 600 (plus) species of the Eucalyptus group, a group which is almost confined to Australia — there are two species in Timor and one in Mindanao and a handful in Papua-New Guinea.

Next to Eucalypts in being almost exclusively Australian are the acacias, widely known as "wattles". They range from tiny shrubs with inconspicuous flower heads to large trees with masses of globular golden flowers. *Acacia pycnantha*, the Golden Wattle, is regarded as the Australian national emblem. Many acacias are features of attraction in gardens all over the world. One species, *A. mearnsii*, known as Black-wattle, is a major source of tannin, and commercial plantations of this species have been established in overseas countries for very many years.

More than 200 of the 500 Australian species of acacia have been established in the Gardens, in different sections according to their climatic and other needs. Some, indigenous to Black Mountain, have been left growing in the places of their own choosing even though, sometimes, they do not belong to the family grouped in the vicinity by the horticulturists. Where a beautiful specimen tree or shrub has come up naturally, it would be against all principle to remove it.

Flowering time for acacias is quite a procession. Some begin to colour long before the end of the winter, others not till mid-October, making the acacia section of the Gardens one of the most attractive areas right through the spring — with September the best month.

There are two main ways of arranging living plants for study in a botanical garden: they can be grouped according to their systematic affinities — species in the same genus being planted together and genera in the same family being near one



Acacia boormanii. The "Snowy River Wattle" makes a delightful garden subject growing to about 8 ft.

another — or they can be planted in groups as they are found naturally growing together.

Both systems are in use here. For instance, a great number of species of acacia are grouped in one relatively dry area, while in the Rain Forest a much smaller number which are naturally found in damp shady areas have been planted. But this basic pattern is not followed inflexibly. If a plant which requires, say, a swampy place would be deprived of it by the predetermined arrangement, specimens of that variety will be planted in a marsh garden or nearby. The first aim is to make the plants grow well.

By this arrangement, a student who has come to study a particular plant could find examples in a number of different locations and could observe the effect, on growth, of the different climates and environments.

But in designing the lay-out of the Gardens, to cater for the needs of the scientists and students on the one hand, and on the other the greater number who come to enjoy the beauty without wanting to explore the scientific aspects, a happy arrangement has been made that is in no way a compromise. A special path which passes through areas planted to display the most colourful species, gently winds and turns as it leads from the main entrance to rise by easy gradients to the top of the Rain Forest Gully then down through the Forest to come out at the car park, near where it began. This is the White Arrow Path, recommended to visitors. The plantings on either side of the path show examples of nearly all the genera growing in the Gardens. The length of the White Arrow Path is about a mile.

At intervals along this path other paths lead off to the areas laid out principally for scientific study, displaying the various species in their generic and endemic groups, but they have a fascinating interest for anyone who would wish to know a little bit more about the diversity and unique character of Australian flora. And these side paths provide convenient short cuts back to the entrance for those who do not have time to make the full tour, or for those who wish to rest a while.

For proper study it is desirable to be able to compare a plant at different stages of growth, from the juvenile plant to the mature specimen. This accounts for some areas in the study section appearing to be planted sparsely but, in time, as younger plants go in alongside the older ones, the bareness disappears.

It will be noticed that labels give the botanical names, sometimes the place of origin of the specimens, but seldom any common name. The botanists explain that the botanical name on the label is accurate and provides the key to scientists who work to a universal system of classification and taxonomy. And they add that "... an electoral roll does not set out people's nicknames". In any case, a very great number of Australian plants have different common names in different localities. The tree carrying the label *Eucalyptus delegatensis* is commonly called "Alpine Ash" in New South Wales, "Woolly Butt" in Victoria, "Silvertop Stringybark" in Tasmania — and its timber is marketed as "Tasmanian oak".

There are misnomers that can cause resentment in some places: *Boronia megastigma* is a good example. An enterprising Victorian nurseryman began growing it many years ago and the cut flowers sold by Melbourne florists were called "Melbourne Boronia". The fact is that the plant grows naturally in a limited area in Western Australia only! "Boronia megastigma" is hardly



Anigozanthos pulcherrima, the Yellow Kangaroo Paw from Western Australia, needs frost protection

likely to come into common parlance so nobody would quarrel if it became known as "Brown Boronia" the name now used by most nurserymen.

It would be impossible, even if it were thought desirable, for this book to contain a list of all the species growing in the Canberra Botanic Gardens, for there are over 3,000. If a visitor should wish to see some particular species, an inquiry at the Office will pinpoint it ... if such a species is growing.

But there are close on 20,000 species of Australian plants and nobody knows what number of these will ultimately be grown in the Gardens or one of its annexes. Large tropical trees are out of the question and, anyhow, scientists wanting to study them would not expect to see them in Canberra. Tropical orchids and the smaller tropical shrubs, ferns and plants are expected to form a sizeable collection when adequate glasshouses are built to accommodate them. Experiments so far, in somewhat less than optimum conditions, are encouraging.

The aim is to bring the more colourful and interesting specimens from the glasshouses to the conservatory for short periods, at appropriate times, so that visitors can enjoy their beauty. Some day in the future it will be possible to open some tropical houses to public inspection, but not at the present stage of development.

The planners confess that when the Gardens were being laid-out the scientific nature of the project caused them to imagine that general public interest would be no more than moderate, so they planned a car-park to accommodate about 50 cars. They soon discovered this was an underestimate and extended the area to take 155. Plans are in hand to extend still further to accommodate another 100, but the construction will wait until an estimate of probable requirement is made after attendances settle down following the official opening.

If the present rate of development continues, the whole of the 100 acres of the Gardens now fenced will be fully planted by 1975. By that time an adjoining Black Mountain area will have been laid out and landscaped, ready for the introduction

of more specimens and species from the propagation houses. Another car park will then be needed.

But whatever extensions are made to the Gardens in the future, the White Arrow Path is likely to remain first favourite for visitors because of its special design with the emphasis on variety and floral beauty.

The path begins at the Lookout at the car park. Here, the visitor will see a large map of the Gardens, to which labels are fixed showing which plants are in flower on that day. Alongside the map is a box containing brochures and carrying the invitation to "Take One". The visitor may then mark the map in the brochure to correspond with the label on the large map, if there is any particular plant he would not want to miss.

The path leads down immediately with a few steps into the shade of the lower end of the Rain Forest, where the natural dry bush gully has been transformed by contriving landscapers and horticulturists into a series of waterfalls and pools, with moist rock pockets and crevices displaying tiny ferns and shrubs, obviously quite contented a thousand miles from home. And, high above, the tall eucalypts — hosts to stag- and elk-horns and trailing orchids — filtering the sunlight as their part of the conspiracy.



Callistemon citrinus, the Red Bottlebrush, is hardy to frost

Within a few yards the path leads up again, out of the Rain Forest, to lead through another series of aquatic and marsh plantings beside larger pools in open sunlight, then through the first large section designed to demonstrate the botanical relationships of plants. The first family represented is Myrtaceae, the one which included some of the most widely known and dispersed members of the Australian flora — the Eucalypts, Callistemons (Bottlebrushes), Leptospermums (Tea-trees) and many others.

In the next large section Paper-barks (Melaleuca) put on an attractive show of grey foliage with yellow-green and purple tints all the year round, enhanced in late spring by clusters and spikes of white, cream, mauve or red flowers. To the left are beds of mature Bottlebrushes which flower from mid-November to January.

This planting dates from 1950. Melaleuca species are hardy plants. Though some prefer swamp conditions, most of them can scorn drought and cold.

A smaller area to the right of the path as it swings abruptly to the left is planted with members of the Rhamnaceae family — including the Pomaderris with its masses of small yellow flowers in mid-spring, and the Spyridium.

Then comes an area planted with small shrubs of the Compositae, the Daisy family. The white or mauve daisies (Olearia) are at their best in spring. These tend to grow brittle and straggly after a few years and break easily in strong winds, but they are easily replaced from seeds or cuttings. Large open patches of ground here allow for annual planting of bright everlasting daisies, such as pink Helipterum, much sought after for "dried flower" arrangements.

A corner here, shaded by native eucalypts, displays a collection of Wattles, and Native Rosemary, all flowering in early spring.

A massed planting of Grevillea hybrids introduces another important family, Proteaceae, in which Hakeas, Waratahs and others form a particularly interesting group, botanically and horticulturally. This area of the garden illustrates the striking variations in leaf shapes and plant forms and the wide range of colours in the different genera and species. Different Grevilleas flower at different times right through the year,

but the best displays are in spring. Nevertheless, many of the species flower in winter and are amongst the best of the winter flowering Australian plants.

The path now leads beside a lawn with Hakeas planted as specimens. Another lawn nearby is the proposed site for a conservatory and large rockery for displaying the many hundreds of dwarf Australian plants.

A third lawn, the Eucalyptus Lawn, embraces a large area to the visitor's right. It holds more than 100 species, some dating back to Dr. Pryor's early plantings, many of quite recent acquisition, and a few original inhabitants of the sclerophyll forest since before Canberra was even a dream.

The slope of the Gardens allowed for the positioning of introduced species according to their preferences in temperature and altitude.

About 50 yards along the path there is a striking collection of about 90 different species of Acacia (Wattles). The number of species is so diverse that there is no month of the year when there are no wattles in flower. In a mild winter, up to fifteen different wattle species will be in flower, but in springtime it is a mass of colour ranging from palest cream to deep orange, and the perfume fills the gardens.

At the end of the long wattle border the path has reached almost its highest point. The plantings here include the Boronia; the Brown, with its delightful scent, and others with pink or magenta flowers which flower in early October. Cream Phebaliums and pale pink Wax-flowers (Eriostemons), hardy to frost but not to drought, share an area with a small group of the Myoporum family, some of which are native to very dry areas.

Close by is one of the three shelter and lookout points where the visitor can relax and take in the imaginative architecture of Civic Centre with the Australian War Memorial and Mount Ainslie in the background, while other lookouts reveal the distant view of Mt. Majura or a tree-framed glimpse of Lake Burley Griffin or the lakeside area of the Parliamentary Triangle.

A by-path leading up the slope of Black Mountain skirts the top end of the Eucalyptus Lawn and an area planted with Banksias, Dryandras and other Proteaceae, leading through to Malvaceae (Hibiscus, etc.) and a special area planted with Myrtaceae from Western Australia. This is off the beaten track but well worth a visit by anyone interested in seeing how a native area is being adapted to the Gardens' special purpose.

From the shelter in the Boronia area, the White Arrow Path leads down into the topmost part of the Rain Forest Gully.

In September, along the bank at the edge of the gully, blue Stypandra and yellow Diuris orchids, growing wild, put on a charming display.

The first bridge crosses the gully to an area previously dry and rocky, and exposed to summer heat. It is interesting to note how the introduction of a regular water supply has improved the quality and quantity of the self grown plants by comparison with those of similar species only a short distance away, living under the old conditions.

The White Arrow Path now leads down through the gully, back to the car park, where it started.

Though the path does not pass close to any of the administrative offices, nor any of the buildings where the botanists and the horticulturists are at work, there is easy access to all of these, according to their purpose. The Main Office, where visitors may see examples of botanical specimens on display near the Enquiry Desk, the Herbarium and



Marianthus ringens is a Western Australian creeper

the Main Depot for garden maintenance equipment are grouped near the entrance. The propagation houses, glass houses and shade houses are further away. As has been explained, with the exception of the Display Room, the offices, the herbarium and other buildings are not open to visitors.

Mention has been made of the two annexes and though these are not open for inspection, a short description of them may be of interest.

The Coastal Annexe is an area of 193 acres 50 feet above sea level and adjoining a small lake near the Royal Australian Naval College at Jervis Bay. (Jervis Bay is part of the Australian Capital Territory, acquired from the State of New South Wales in order to comply with the requirement of the Seat of Government Act that the Federal Capital Territory should have, among other things, access to the sea.)

It is almost a frost-free region and many species which would suffer greatly in Canberra's harsher climate during the early months of their lives are grown there successfully.



Persoonia pinifolia

Each autumn and spring, between 1,000 and 1,500 newly propagated plants known or feared to be susceptible to frost damage are transferred from the Canberra Gardens propagation and shade houses into open beds at Jervis Bay. Once established they are used as parent stock; cuttings are brought back to Canberra where they are propagated in quantity. These plants are later tried out in selected areas in the Canberra Gardens to see whether suitable conditions can be found or provided there.

Not only does this arrangement establish whether cuttings taken on field trips in drier, warmer areas of Australia can be cultivated in Canberra, it reduces the risk of the Gardens losing valuable plants, of which little is known, by exposing them to the fairly rigorous Canberra climate without having the opportunity of trying them out under more sympathetic conditions.

In the opposite direction, species of alpine plants are being cultivated at Jervis Bay to establish how they fare under low-altitude high-humidity conditions. Observations here should be useful to the horticulturists engaged in hybridising work, in which they seek to develop new varieties for domestic planting.

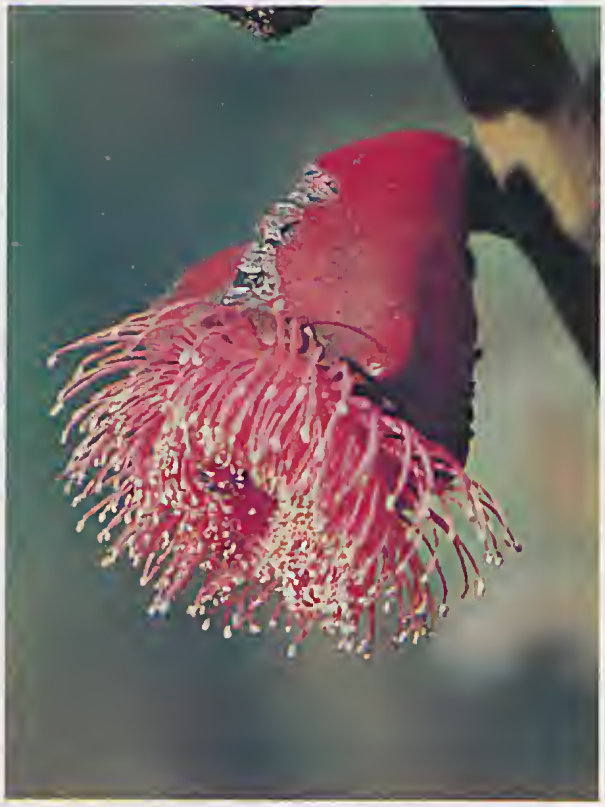
The Jervis Bay annexe terrain ranges from semi-rain forest to low sandstone heath and includes natural swamplands which have their own peculiar flora. Birdlife is prolific and all the area is a flora and fauna sanctuary. As with the Canberra Gardens, development always takes into consideration the need to preserve the friendly native birds and animals as well as the beautiful and interesting indigenous flora.

Occasionally strong winds coming in from the sea do damage to a few susceptible plants and the sea spray carried on the wind has salt-burned some foliage, but a dense windbreak of coastal eucalypts and other suitable genera is effective protection for the smaller plants growing in the leeside.

The other annexe, at Mount Gingera at an altitude of about 6,000 feet close to the western boundary of the Australian Capital Territory, encloses 10 acres of primitive alpine flora. This particular small area is described as the only accessible area of natural alpine flora in the A.C.T. and its acquisition was made more to ensure its preservation than for horticultural objectives. No planting has been done at Gingera but a number of cuttings have been taken for experimentation in the Canberra Gardens and some species are now growing in the sub-alpine garden and marsh area of the Gardens.



Dianella tasmanica has blue flowers and blue berries



Eucalyptus tetraptera, the Square Fruited Mallee

The sub-alpine garden contains species mainly collected from the Snowy Mountains, some from near the summit of Mt. Kosciusko (7,316'), Australia's highest mountain, and all are growing well. They include Snow Daisies *Celmisia longifolia*, Trigger plants *Stylidium gramminifolium*, Daisy bushes *Olearia spp* and Native Fine *Podocarpus lawrencei*.

In the adjacent Coastal Heath garden successful plantings have been made of species collected on the east coast of New South Wales. Among them are Christmas Bells *Blandfordia nobilis*, Heaths *Epacris spp*, Banksias and Bottlebrushes *Callistemon spp*. This heath area merges into a coastal marsh, where plants of the Vanilla Lily *Sowerbaea juncea*, *Lobelia* and *Cotula* and many others may be seen.

Both the sub-alpine and Coastal Heath gardens are fairly recent developments and each has been landscaped to duplicate the natural ecological environment of plants which grow in areas such as these; they have been grouped just as they would appear if growing naturally.

Other ecological sections will be developed in the Gardens as soon as circumstances and conditions will allow, presenting whole communities from the Hawkesbury Sandstone of N.S.W., the Grampians of Victoria, the Stirling Ranges of South Australia, and so on — and on.

A happy side effect of growing such a variety of native plants in profusion is the abundance of bird life in the Gardens. Birds seldom seen in other parts of Canberra have now made the Gardens their home on an all-the-year-round basis. Nectar-producing plants, flowering in the winter, attract the honey-eaters who previously fled the district on the approach of colder months. The Rain Forest, the pools and the marsh areas provide food for others by encouraging the multiplication of insect life, and the shrubs and trees are safe havens and nesting places.

Gardeners and other members of the staff are alert to note a newcomer or a new nest. They work in close collaboration with Canberra ornithologist Stephen J. Wilson who has listed 105 different species he has seen in the gardens — all but four

of them Australian natives! A special comment by Mr. Wilson on Birds in the Canberra Botanic Gardens is included in this book.

The fencing of the area was originally intended to keep out rabbits and wandering stock. It happens that it also keeps out foxes, and that has contributed to the safety of the birds and small indigenous native creatures, such as the quaint ant-eating echidnas and the possums, of which there are many enjoying the sanctuary. No native animals have been introduced into the Gardens and any wallabies or wombats that sneak in from Black Mountain are invited to leave promptly. They, unfortunately, have little respect for botany or horticulture.

So, what began as a small experimental area set aside for scientific study has acquired other characteristics not forecast by its early planners, though they probably half expected that this would be the outcome some day. If the search for knowledge had been the only goal, it is almost certain that the gardens would have been laid out with formal precision. But botanists and horticulturists have another side to their character. When a botanist says to a horticulturist: "Here is an interesting collection of *Callistemon citrinus*", they are both saying to themselves: "What a gorgeous garden of Crimson Bottlebrushes!"

If that explains why the Gardens are what they are, it might also explain why experiments in hybridization have such a high priority in future development. So many Australian plants are already adding charm and interest to home gardens, landscaping and institutional plantings, that the challenge to extend the number is irresistible. Many of the beautiful and unique species that now show reluctance to accept domestication will surely be induced to yield to the gentle persuasion of the hybridizers.

The ruthless demands of economic progress in earlier times had small regard for the preservation of Australia's flora and fauna. Now, every day sees an increase in awareness of the urgent need to protect and conserve these natural treasures.

The Canberra Botanic Gardens, by its dedication to the study and display of Australian native flora, serves to emphasise the national character of that responsibility.

BIRDS IN THE GARDENS

The so-called "opening up of an area" for man's habitation or economic development has meant, more often than not, disaster for indigenous wild life. "When man moves in, the birds move out." There are few exceptions. Canberra, fortunately, is one.

In December 1820, when explorers Charles Throsby Smith, James Vaughan and Joseph Wild came this way in search of the big river Murrumbidgee mentioned by the Aborigines they came upon a wide expanse of undulating grassland crossed by a meandering stream with reedy tributaries, and surrounding hills clothed with dry sclerophyll forest.

Surprised quail whirred through the dry grass, Straw-necked Ibis probed the marshy flats, pink breasted grey Galahs held a parade and sulphur-crested White Cockatoos flocked into the tall gum trees at sundown. There were Magpies, Mudlarks and Kookaburras, of course, and countless smaller birds in bushes and in reeds ... (but no Sparrows, Starlings, Blackbirds or Goldfinches: they came later, with civilisation).

Through the next 90 years, while the Limestone Plain carried flocks of sheep and sundry cattle, the native birds were still there in profusion. Then the surveyors came in and then the builders; yet the birds stayed. But the plan for the National Capital had been devised by a nature lover, and his "garden city" was to be planted with trees and shrubs by the thousand, along avenues and in parks, and everywhere.

As the buildings went up and there was the noise and bustle of progress all around, some timid birds moved further out but many stayed.

Hedges of exotic pyracantha, hawthorn and privet put new berries on the menu and some provided safer nesting places. The introduction, over many years, of native plants not indigenous to Canberra, encouraged migratory birds from other parts to stay over winter instead of passing through.

And now the bird population is greater in numbers of individuals and variety of species than ever before. For this the Botanic Gardens can be given much of the credit.

Three factors are necessary in a habitat to enable

Superb Blue Wren



it to maintain birds throughout the year: food, shelter and suitable nesting sites. The Botanic Gardens has all three in abundance. The hundred acres of the Gardens is only a small part of the Black Mountain Reserve, yet because it has been planted with such a variety of plants and has a plentiful water supply, there are many more birds and many more species in the Gardens than on all the rest of Black Mountain.

Another factor is that birds seem to have a marked preference for what ornithologists call "edge country" where different kinds of habitat are close together. The Gardens meet this requirement because of the special lay-out, in which some areas have been developed as dry forest with both naturally grown and introduced trees, or as open grassland, or as marshy areas, or as temperate zone rain forest, and so on.

The native dry forests of the Canberra region produce nectar only at some times of the year, mainly in spring. Consequently the Gardens with their extensive plantings of Banksias, Grevilleas and Eucalypts which flower through the colder months attract and hold throughout the year very many species of honeyeaters who would never stay otherwise.

Cultivated, watered areas have higher insect populations than natural forests and many of the introduced species of plants have their own special encouragement to insect proliferation, so that the insect eaters are well provided for.

Seed eating birds find ample quantity and variety in the Gardens, from the fine grass seed enjoyed by smaller birds to the larger seeds shed by hundreds of wattles to make feasts for Painted Quail and Common Bronzewings.

January and February are the hottest months in Canberra, but when there has been good summer rain, birds will be found nesting for much of this time. Even in dry years (which are more common) nesting usually continues well into January.

Some grass seed eaters, such as the Red-browed Finch and the Double-bar Finch, continue to breed much later than other species and active



White-throated Warbler



Yellow-faced Honeyeater

nests have been found right through to the end of April. These two species like the dense cover of shrubs in the Gardens as nest sites. Canberra is the southern extremity of the range of the Double-bar Finch and the species is more numerous in the Gardens than anywhere else about the city.

Among other summer breeders are the Yellow-faced Honeyeater, the White-naped Honeyeater and the Orange-winged Sittella. The Yellow-faced Honeyeater builds its nest in the outer foliage of almost any of the shrubs but the other two prefer to nest in the older native trees. The introduced Callistemon and Melaleuca plantings are important summer nectar producers which provide essential food and indirectly extend the breeding season.

Many species of Honeyeaters move considerable distances in the cooler months in south-eastern Australia, sometimes because of the severity of the winter but usually in search of more abundant food. During the colder months, many species of Honeyeaters are to be found in the Gardens but elsewhere in Canberra they will be seldom seen at this time. Food is the attraction. Banksias commence flowering in the autumn and then as the days become cooler the Grevilleas and the Eucalypts start their nectar flow.

Certain birds seem to have a mysterious instinct or sense for finding nectar plants. Whatever it is they are able to detect a nectar flowering plant from a long way off. Combined with this they have an instinct which enables them to return to the spot at the exact time year after year. Banding of birds, under the Australian Bird Banding Scheme, C.S.I.R.O., in the Gardens has established the return of many individuals of several species over succeeding years. Notable among these species are the Eastern Spinebill, the Yellow-winged Honeyeater, the Crescent Honeyeater, as well as the more common Yellow-faced and White-naped Honeyeaters.

Some members of each of these species have been recorded as breeding in the Gardens. Red Wattle-birds, too, flock to the Gardens in winter. Their particular attraction is the nectar of the *Banksia ericifolia*.

Winter brings the Robins. The Canberra Botanic Gardens is one of the very few places where all five species of Australian Robins have been reported. Even the rare Pink Robin of Tasmania and southern Victoria has appeared in some years. Gang-gang Cockatoos come down from the mountains to feed in the Eucalypts in the Gardens, varying their diet sometimes by excursions into the Canberra parks for a taste of the seeds of the various exotic cypress.

King Parrots are often seen and the two Rosellas (Crimson and Eastern) are common.

As winter progresses the Black-backed Magpies and an occasional pair of Ravens begin to nest in the taller branches of the eucalypts, preferring the older natural trees. Some of our smallest birds choose winter to begin their breeding cycles, the Buff-tailed Thornbill preferring nest sites on or near the ground, while the Yellow-tailed Thornbill usually selects the outer pendant branches of the Eucalypts and the Mistletoes.

During winter, in Canberra generally, many species disappear as they leave for the warmer north, and in the city and suburban areas the bird numbers and species drop to their lowest levels of the year. But in the Botanic Gardens, because of the abundance of everything they need, a great number of birds of several species refuse to join the exodus and stay on. With all the new plantings



Yellow-tailed Thornbill

of native flora around the city and suburbs it is likely that more and more birds will choose to stay in the A.C.T. over winter, but, at the same time, the extension of planting and the maturing of flora in the Gardens will ensure that the Gardens will continue to be first favourite.

With early spring more nectar-bearing plants come into flower; by this time every species of Grevillea is in bloom. Those birds that moved north for winter begin to return and the bird population soon rises to its high peak. One notable species is the Fuscous Honeyeater, arriving in very large numbers and staying from about September to November. The Fuscous Honeyeater is only a visitor, in spite of its numbers. So far, the species has never been known to breed in Canberra . . . their nearest nesting places are near Tumut and Tumbarumba. Some come to the Gardens in the autumn with flocks of other migrating birds and a few stay on over winter. There is another greater influx in the early spring when their numbers rise rapidly. But round about October the breeding urge takes over and they take off again to reappear the next time there is a flush of Grevillea nectar in the Gardens.

Acacias (Wattles) and *Prostantheras* (Mint Bush) begin to flower in very early spring and they provide food in an indirect way; they attract insects and the insects are food for all species of perching birds.

Shrub varieties of Acacias, Hakeas, Melaleucas, and Callistemons are valuable nesting sites for many of the smaller kinds of birds, and these shrubs make a dense cover and admirable hide-out for the Blackbirds, the only introduced species of bird that is abundant in the Gardens. The Common Bronzewing, one of the beautiful native pigeons, also nests in low dense shrubs. The rare Painted Quail make their nests on the ground on the drier grassy slopes.

As spring progresses the number of species breeding in the area increases quite remarkably. The Superb Blue Wren, the Speckled Warbler and several species of Robin, including the Flame, the Scarlet, the Hooded and the Yellow, all breed in the gardens regularly.

Cockatoos and most of the Parrots visit the Gardens only for food, preferring to raise their broods further away from civilisation, but the two Rosellas, the Crimson and the Eastern have established nests in hollow branches and holes up high in the older Eucalypts.

Spring brings five different kinds of Cuckoos to the Gardens, seeking out some well-built little nests of smaller birds where they can lay their eggs and leave the work of raising the progeny to others.

Later in the season the White-throated Warbler, the rare Western Warbler and the tiny Brown Weebill set about hanging their nests in the outer branches of low trees.

Right through spring and into mid-summer the Botanic Gardens ring with the calls of the breeding birds and the tiny voices of their demanding young.

The Eucalypts are also the favoured nesting sites of several of the Honeyeaters, the Orange-winged Sittella and the brightly coloured Eastern Shrike-Tit. The White-throated Treecreeper and many other species make their nests in tree holes of various sorts, while the Noisy Friar-bird and the White-naped Honeyeater use the tips of the outer foliage for their nest-building.

But the birds mentioned here are only a few of the 105 species observed in the Gardens. So far there are 59 resident species and it is confidently expected that more and more will pay the visit to Canberra and stay. Already two quite rare birds have been seen in the gardens. A brilliant male Scarlet Honeyeater was seen feeding on *Eucalyptus cosmophylla.* This is the only record of this species in the district, and a solitary Yellow-tailed Pardalote (also the only A.C.T. record) has been seen.

This remarkable bird population has been building up gradually over twenty years while the Gardens were being developed, and while the only humans round the place were friends who respected their rights and took care not to disturb their lives.

Now that the Gardens are open to visitors, and traffic through the Gardens will increase rapidly, it will be interesting to see the effect on the birds. The ornithologists are confident that, provided visitors resist the temptation to pry too closely or to touch nests or surrounding shrubbery, the birds will be content to stay . . . and multiply.

Though the Canberra Botanic Gardens are primarily for the study and conservation of Australian native flora, with ready access to all parts for the convenience of visitors, it is important that the whole environment should be as natural as it is possible to make it. And birds are an indispensable part of the ecology as well as of the picture. That so many different species of Australian native birds have made the Gardens their home is surely the nicest compliment the staff of the Gardens could ever be paid.

LIST OF SPECIES (COMMON AND SCIENTIFIC NAMES) RECORDED FROM THE BOTANIC GARDENS

Breeding—Species known to breed in the Gardens are indicated by an asterisk.
Abundance—A relative indication of numbers present is given by terms ranging from "extremely rare" for species recorded only once, through "very rare", "rare", "irregular sightings", "occasional", "uncommon", "fairly common", "common" to "very common". These are indicators only and are not precise.
Seasonal presence of species in the Gardens—This is indicated by the following terms:
Nomadic—tends to wander and can occur at any season.
Migrant—moves seasonally. Normally all birds of the species move. Most migrant species occur in the A.C.T. over the warmer months. Those few which migrate here over winter are indicated.
Altitudinal migrant—a species normally found in the nearby high country over summer and which appears near Canberra in winter.
Partial migrant—where most of the birds of a species move from the area seasonally. Some individuals remain where suitable food is available, e.g. in the Gardens.
Passage migrant—where the species moves through the area in spring and summer on migration but does not stay to breed.
Resident—to be found in the Gardens or nearby at all seasons of the year and not subject to nomadic or migratory movement as a species.

Species	*Status*
Painted Quail (*Turnix varia*)	Rare resident.*
Common Bronzewing (*Phaps chalcoptera*)	Fairly common resident.*
Black Duck (*Anas superciliosa*)	Roosts in the Gardens.
Australian Goshawk (*Accipiter fasciatus*)	Occasional. Resident.
Collared Sparrowhawk (*Accipiter cirrocephalus*)	Occasional. Resident.
Black-shouldered Kite (*Elanus notatus*)	Occasional. Resident.
Little Falcon (*Falco longipennis*)	Occasional. Resident.
Peregrine Falcon (*Falco peregrinus*)	Occasional. Resident.
Brown Falcon (*Falco berigora*)	Occasional. Resident.
Nankeen Kestrel (*Falco cenchroides*)	The most common hawk. Resident.*
Boobook Owl (*Ninox novae-seelandiae*)	Occasional. Resident.*
Little Lorikeet (*Glossopsitta pusilla*)	Nomadic. Occasional.
Gang-Gang Cockatoo (*Callocephalon fimbriatum*)	Common in winter. Occasional in summer.
White Cockatoo (*Kakatoe galerita*)	Rare. Resident.
Galah (*Kakatoe roseicapilla*)	Occasional. Resident.
King Parrot (*Aprosmictus scapularis*)	Occasional, chiefly in winter. Nomadic.
Crimson Rosella (*Platycercus elegans*)	Common. Resident.*
Eastern Rosella (*Platycercus eximius*)	Common. Resident.*
Red-backed Parrot (*Psephotus haematonotus*)	Regular in small numbers. Resident.
Tawny Frogmouth (*Podargus strigoides*)	Regular in small numbers Resident.*
Dollar-bird (*Eurystomus orientalis*)	In small numbers. Migrant.*
Kookaburra (*Dacelo gigas*)	Common. Resident.*
Sacred Kingfisher (*Halcyon sanctus*)	In small numbers. Migrant.*
Spine-tailed Swift (*Claetura caudacuta*)	Irregular sightings. Nomadic migrant.
Pallid Cuckoo (*Cuculus pallidus*)	In small numbers. Migrant.*
Fan-tailed Cuckoo (*Cacomantis pyrrhophanus*)	In small numbers. Partial migrant.*
Brush Cuckoo (*Cacomantis variolosus*)	Rare. Migrant.
Horsfield Bronze-Cuckoo (*Chalcites basalis*)	In small numbers. Migrant.*
Golden Bronze-Cuckoo (*Chalcites plagosus*)	The most common Cuckoo. Migrant.*
Welcome Swallow (*Hirundo rustica*)	Occasional. Partial Migrant.
Tree Martin (*Hylochelidon nigricans*)	In small numbers. Migrant.*
Grey Fantail (*Rhipidura fuliginosa*)	Common. Partial migrant.*
Rufous Fantail (*Rhipidura rufifrons*)	Rare. Passage migrant.
Willie Wagtail (*Rhipidura leucophrys*)	In small numbers. Resident.*
Leaden Flycatcher (*Myiagra rubecula*)	In small numbers. Migrant.*
Restless Flycatcher (*Seisura inquieta*)	Occasional. Resident.*
Jacky Winter (*Microeca leucophaea*)	Occasional. Resident.*
Scarlet Robin (*Petroica multicolor*)	Occasional. Resident.*
Red-capped Robin (*Petroica goodenovii*)	Rare. Nomadic.
Flame Robin (*Petroica phoenicea*)	In small numbers autumn to spring. Altitudinal migrant.*
Pink Robin (*Petroica rodinogaster*)	Very rare. Migrant. Winter only.
Rose Robin (*Petroica rosea*)	Rare. Passage migrant autumn and spring.
Hooded Robin (*Petroica cucullata*)	In small numbers.*
Southern Yellow Robin (*Eopsaltria australis*)	Common. Resident.*
Golden Whistler (*Pachycephala pectoralis*)	Common except in summer. Altitudinal migrant.*
Rufous Whistler (*Pachycephala rufiventris*)	Common early spring to late autumn. Rare in winter.*
Olive Whistler (*Pachycephala olivacea*)	Very rare. Winter only. Altitudinal migrant.
Grey Shrike-Thrush (*Colluricincla harmonica*)	Common. Resident.*
Magpie-lark (*Grallina cyanoleuca*)	Common. Resident.*
Eastern Shrike-Tit (*Falcunculus frontatus*)	In small numbers. Resident.*
Black-faced Cuckoo-Shrike (*Coracina novae-hollandiae*)	Common. Partial migrant.*
White-winged Triller (*Lalage sueurii*)	Common. Migrant.*
Australian Ground-Thrush (*Oreocincla lunulata*)	Very rare. Winter only. Altitudinal migrant.*
White-fronted Chat (*Epthianura albifrons*)	Occasional near the water features.*
White-throated Warbler (*Gerygone olivacea*)	Common. Migrant.*
Western Warbler (*Gerygone fusca*)	Rare. Possibly nomadic.*
Brown Weebill (*Smicrornis brevirostris*)	Very common. Resident.*
Eastern Whiteface (*Aphelocephala leucopsis*)	Rare. Resident.*
Striated Thornbill (*Acanthiza lineata*)	Very common. Resident.*
Little Thornbill (*Acanthiza nana*)	Very rare. Resident.
Brown Thornbill (*Acanthiza pusilla*)	Common. Resident.*
Buff-tailed Thornbill (*Acanthiza reguloidas*)	Very common. Resident.*
Yellow-tailed Thornbill (*Acanthiza chrysorrhoa*)	Very common. Resident.*
White-browed Scrub-Wren (*Sericornis frontalis*)	Fairly common. Resident.*
Speckled Warbler (*Chthonicola sagittata*)	Fairly common. Resident.*

Reed Warbler (*Acrocephalus australis*)	Rare. Near water features. Migrant.*
Superb Blue Wren (*Malurus cyaneus*)	Very common. Resident.*
White-browed Wood-Swallow (*Artamus superciliosus*)	Rare. Migrant.*
Dusky Wood-Swallow (*Artamus cyanopterus*)	Uncommon. Migrant.*
Orange-winged Sittella (*Neositta chrysoptera*)	Common. Resident.*
White-throated Treecreeper (*Climacteris leucophaea*)	Common. Resident.*
Mistletoe-bird (*Dicaeum hirundinaceum*)	Uncommon. Resident.*
Spotted Pardalote (*Pardalotus punctatus*)	Very common especially in winter. Resident.*
Yellow-tailed Pardalote (*Pardalotus xanthopygus*)	Extremely rare. Nomadic.*
Yellow-tipped Pardalote (*Pardalotus striatus*)	Uncommon. Winter only. Migrant.
Eastern Striated Pardalote (*Pardalotus ornatus*)	Very common. Resident.*
Striated Pardalote (*Pardalotus substriatus*)	Rare. Resident.



Grevillea robusta, the Silky Oak, is a rain-forest species that adapts well

Eastern Silvereye (*Zosterops lateralis*)	Very common. Large numbers in winter. Resident.*
White-naped Honeyeater (*Melithreptus lunatus*)	Very common in early spring. Partial migrant.*
Brown-headed Honeyeater (*Melithreptus brevirostris*)	Fairly common. Resident.*
Scarlet Honeyeater (*Myzomela sanguinolenta*)	Extremely rare. Migrant.*
Eastern Spinebill (*Acanthorhynchus tenuirostris*)	Extremely common particularly in winter. Resident.*
Regent Honeyeater (*Zanthomiza phrygia*)	Uncommon. Nomadic.*
Fuscous Honeyeater (*Meliphaga fusca*)	Small numbers in winter. Very common spring. Migratory in Canberra area.
Yellow-faced Honeyeater (*Meliphaga chrysops*)	Extremely common especially in spring. Partial migrant.*
White-eared Honeyeater (*Meliphaga leucotis*)	Common in winter. Altitudinal migrant.
Yellow-tufted Honeyeater (*Meliphaga melanops*)	Occasional in winter. Nomadic.
White-plumed Honeyeater (*Meliphaga penicillata*)	Fairly common. Resident.*
Crescent Honeyeater (*Phylidonyris pyrrhoptera*)	Common in winter. Altitudinal migrant.*
Yellow-winged Honeyeater (*Meliornis novae-hollandiae*)	Fairly common particularly in winter. Resident.*
Red Wattle-bird (*Anthochaera carunculata*)	Common, particularly in winter. Resident.*
Noisy Friar-bird (*Philemon corniculatus*)	Very common. Migrant.*
Pipit (*Anthus australis*)	Occasional in the grassy areas. Resident.
Double-bar Finch (*Steganopleura bichenovii*)	Very common. Resident.*
Red-browed Finch (*Estrilda temporalis*)	Common. Resident.*
Raven (*Corvus coronoides*)	Common. Resident.*
White-winged Chough (*Corcorax melanorhamphus*)	Occasional. Resident.*
Pied Currawong (*Strepera graculina*)	Very common in winter, occasional in summer. Resident.*
Grey Currawong (*Strepera versicolor*)	Rare. Resident.*
Black-backed Magpie (*Gymnorhina tibicen*)	Very common. Resident.*
White-backed Magpie (*Gymnorhina hypoleuca*)	Now regarded as a race of the above species. Rare individuals sighted are probably hybrids.

INTRODUCED SPECIES

Blackbird (*Turdus merula*)	Common. Resident.*
House Sparrow (*Passer domesticus*)	Common near the buildings. Resident.*
Goldfinch (*Carduelis carduelis*)	Occasional. Resident.*
Starling (*Sturnus vulgaris*)	Occasional in the grassy areas. Resident.*

"BOTANICAL GARDENS IN CANBERRA"
A REPORT DEALING WITH SCOPE SITE, BUILDINGS, COSTS OF MAINTENANCE, ETC.
BY
DR. B. T. DICKSON

Canberra, September 4th, 1935.

Botanic Gardens

In preparing the accompanying report concerning the establishment of botanical gardens in Canberra I have endeavoured to foresee every likely main contingency and so to present as complete a survey as possible. Throughout the report, two important considerations were kept constantly in mind. In the first place botanical gardens cannot be created in a short time. They take years to establish and once established they cannot be materially changed in general lay out. Consequently the most careful attention must be given to the choice of site and its suitability for the development of the main features of the gardens. Further if the establishment is once initiated it

should be pursued consistently in order that the scheme may come to fruition in a reasonable period of years.

In the second place it is necessary to be quite clear on the point that botanical gardens cannot be successfully maintained, even if initially well-founded, in the absence of an adequate annual appropriation. For this reason a section is devoted to estimates of annual expenditures which it is thought will obtain when the general lay out of the botanical gardens has been accomplished and attention to detail assumes increasing importance. From the commencement it will be necessary to approve an annual expenditure for some permanent staff under the direction of the Superintendent of Parks and Gardens because the work of establishment cannot be left solely to casual labour but it will be some years before the annual requirement reaches the £15,000 estimated.

No attempt has been made to present any details of lay out because it was assumed that consideration of general principles only was required at the moment. Attention is drawn to several points about the choice of site which is recommended in this report.

It is not to be confused with the area marked on Map 103 B as Canberra Gardens, near the Stadium and Aquarium, which should be ornamental gardens tending to be quite formal in design. Nor does it coincide with the Continental Arboretum scheme suggested by Mr. Burley Griffin for the surroundings of West Lake and the lower Molonglo reaches. Instead the area recommended, as shown in the accompanying rough plan, invades that part of the area set aside for University purposes which approaches the lower slope of Black Mountain and also the residential area alongside the site of the laboratories of the Council for Scientific and Industrial Research. It is necessary to include the former in the area in order to have some approximately level land as a contrast with the large area of slopes and as a site upon which to erect glasshouses, etc., and in which to develop certain specialized sections. It is extremely unlikely that so extensive a massing of University buildings will eventuate as to require the use of this land for such purposes. The area at present allotted to residential development should be included because it is not only conspicuous and susceptible of treatment but it is of some size and has the best gradient and soil of any of the slopes.

The choice of this site is particularly recommended because, while the soil is far from good, it is the most sheltered from strong westerly winds in marked contrast with all the area allotted to the arboretum as shown on Map 103 B and protection from wind is very necessary in Canberra if the best effects are to be obtained.

It is not disguised that the land is gravelly and that the control of the gullies which have developed down the slopes will constitute a difficult problem, though one not impossible of solution. Against this is to be set the scenic beauty of the site with the lake and the mountain forming the lower and upper boundaries.

Development of the scheme, if approved, will necessarily occupy several years and during this time casual labour could usefully be employed for work such as road and path making, gully treatment, drainage, grading, trenching for water reticulation and so forth. Prior to the initiation of developmental work it is obvious that plans of the broad lay out will be required and the preparation of these will entail considerable study because of the relative permanence of the main features of botanical gardens.

In order to facilitate the preparation of a detailed design it is necessary to have a large scale map of the area and this will involve a special survey.

If the site recommended for the botanical gardens is approved the upper slopes of Black Mountain should be constituted a Reserve because there are to be found the most numerous examples of native wild flowers in the city area. It will be a matter for regret in future years if they are not protected now.

In the succeeding pages the proposal is dealt with under the following captions:

I. Type and scope of the proposed gardens.
II. Site of the gardens.
 1. Relation to other city features.
 2. Area.
 3. Accessibility.
 4. Aspect, Soil, etc.
 5. Possibilities of subdivision.
III. Roads, paths and parking areas.
IV. Buildings.
V. Costs of Maintenance.
VI. Scheme of Development.

I. TYPE AND SCOPE OF THE PROPOSED GARDENS

There are in the world about three hundred and fifty botanical gardens, some of which are national, as the Royal Botanic Gardens at Kew, some municipal, as the New York Botanical Gardens in Bronx Park, and some connected with Universities, particularly in Europe, as the Hortus Botanicus at Amsterdam where De Vries carried out his remarkable researches into mutations among plants.

Modern botanical gardens are derived from one-time herbal gardens, whence arose the study of systematic botany, of which an outstanding example is the Chelsea Physic Garden established in 1673. As a result of this derivation the organization of a properly equipped garden involves not only the services of a head gardener and his assistants, but also those of a director and a scientific staff. The modern tendency is for botanical gardens to become a combination of scientific and educational institution and public park, a fact which is well illustrated by the Royal Botanic Gardens at Kew, Le Jardin des Plantes of Paris, Berlin Botanic Garden at Dahlem, the New York Botanical Garden at Bronx Park, and the

Botanic Garden of the Imperial University at Tokyo, Japan.

In view of the anticipated development of Canberra as the capital of the Commonwealth with a University and scientific institutions, the Botanical Gardens should be planned to serve as an additional scientific institution and as Canberra will increasingly become a Mecca for visitors the conception of a public park with aesthetic landscape treatment should be a natural part of any scheme of development. The botanical gardens of the sister national capital at Washington have tended to be more of a public park, and the scientific side has not been developed to the extent that it has in many other places. The authorities would be well advised to plan the proposed gardens at Canberra so that they are developed with a balance between the scientific and the aesthetic, and certainly not to the neglect of the scientific phase. That this is no new or extravagant basis for the establishment of botanical gardens is evidenced by the fact that similar institutions have been developed in Sydney, Melbourne, and other cities, and the scientific staffs have justified their continued inclusion in the scheme from the national point of view equally as public appreciation has justified the expenditure on the aesthetic side.

National education in floral and arboreal beautification of the home, the community and the country, is fostered by visits to botanical gardens where trees, shrubs and plants may be seen in appropriate settings and groupings. Many of our native plants are eminently suited to garden and landscape treatment and this is well recognised abroad for one may read in catalogues of highly prized plants originally obtained from the Australian flora, and similarly we owe much that is worth while in our gardens and parks to exotics. From this point of view, botanical gardens are centres of trial and demonstration and we are well equipped in this respect in the case of coastal zones, but not so far for the highlands and near interior. It is here that the Canberra Gardens may play an important national part. All plants and trees of the Australian flora which are found to be hardy should be grown and in addition exotic plants and trees from homoclimes should gradually be collected for trial, or if already known, for use in these gardens. In this connection one may consider trees for avenues, or as isolated or grouped specimens on lawns, for shade or protection from wind, for autumn foliage or as evergreens, and plants may be thought of for the garden or indoor purposes. Deep fertile soil is not always a necessary requirement for beautification of surroundings because some most beautiful effects can be obtained by the use of alpine and rock plants or by making a heath garden or a bog garden. Consequently for the botanical gardens properly to fulfil their part of their function, they should provide examples of each kind of treatment.

A constant stream of visitors passes daily through the conservatory near the Treasury Gardens in Melbourne, to view the magnificent collections of cyclamen gloxinias, chryanthemums or begonias in their several seasons, and similarly whenever they are available fern-houses, orchid-houses, collection of foliage plants and succulents are a source of delight to thousands of visitors in the course of the year. So much is this the case that no botanical gardens of note are without such houses, and it is very desirable that a group be included in the scheme for Canberra Gardens.

For schools and University, a botanical garden is necessary for the full development of courses of instruction and study in botany as a science, or as applied to horticulture, agriculture, landscape gardening, silviculture and so forth. In fact, as noted earlier, in many cases botanical gardens were not public places at all, but were adjuncts to the Universities.

For scientific studies it is also necessary to have as full a representation as possible of the Australian flora and of specimens from homoclimes. The difference in point of view between the landscape and scientific requirements will occur in those special cases where plants are arranged in botanical groups, e.g., a family or an order for comparison purposes, without regard to effect. With trees and major shrubs also, planting may be arranged on a continental basis, but in this case, landscape composition is possible.

Glass-houses and shade-houses are necessary for University studies and, except in special cases, those which are used for general plant culture can also be used for scientific investigations and particularly so in winter.

II. SITE OF THE GARDENS

1. Relation to other city features:

While it is necessary to consider such questions as suitability of soil, drainage, protection from wind and so forth in selecting a site, it is obvious that consideration should be given in a developing City like Canberra, to the relation of any proposed site to the other major features in the layout of the city and its environs.

In the "Report Explanatory of the Preliminary General Plan" for the Federal Capital (October 1913) Walter Burley Griffin deals with Botanical Gardens under item 2.11121 which has to do with the University. He suggests by diagram on p. 9 of the Report that the Botanical Gardens should be near the University, particularly adjoining the Botanical and Agricultural buildings, and adjoining the Forest Reserve and Black Mountain. On p. 7 of the Report he again refers to the botanical gardens in the paragraph:

> *"The Molonglo is left in its present state in the lower channelled reaches, where it forms a feature of the botanical gardens and forest reserve continuous with Black Mountain, incidentally perpetuating there the only remnant of primeval luxuriance on the city site."*

On Map 103 B, however, the lower channelled reaches of the Molonglo are bounded by areas devoted not to

botanical gardens but to an arboretum scheme on a continental basis. A rough estimate indicates that the area proposed for the arboretum is about 800 acres.

Judging by the diagrams on pp. 8 and 9 of the Report, it would appear that the site for botanical gardens suggested by Griffin is on the Black Mountain part of the water axis of the city and it must be concluded that he considered the arboretum the same as botanical gardens.

The conclusion which the writer has reached as to the site after giving careful consideration to other possible areas is in conformity with the view that it should be near Black Mountain. It is certain, however, that the actual area, as defined by boundaries, which is being recommended is not the same as that which was in the mind of the originator of the plan of Canberra because according to Map 103 B several buildings were projected on the site which is recommended herein.

The site recommended by the writer stretches from the southern boundary of the area occupied by the Council for Scientific and Industrial Research generally southwards along the margin of the lake, including the promontory area marked South America on Map 103 B. The approximately south-western end overlooks the bridge leading to the Zoological Gardens (labelled Australia and New Zealand on Map 103 B) the approximately western boundary is the timber line on the slopes of Black Mountain and the north-eastern boundary at the northern end runs from the 1825 foot contour to University Avenue.

This site is roughly outlined on the accompanying plan and is seen to be about 1¾ miles in length from University Avenue to the tip of "South America" and slightly less to the bridge leading to the Zoological Gardens. In width it varies from about 800 yards at the northern end to 120 yards in the middle. The slope is one in fifty at the northern and one in ten at the southern end. The general appearance of the mountain slope part of the site is shown in the accompanying panoramic photograph taken from the opposite side of the lake and in which the lake position has been vignetted into the photograph. (Photograph 1).

With reference to other features of the city the proposed site of the botanical gardens seems to be most suitable. It is continuous with the site of the Zoological Gardens so that the access road system can be made to complete a circuit of both areas. The mountain backing will not only provide shelter from wind but will augment the beauty of the setting, particularly when the lake completes the scene. It will form a feature which is visible from many points such as Capitol Hill, Acton, Civic Centre, Ainslie, etc., and the planting schemes of Civic Centre, University Ave., the University site, C.S.I.R., etc., will combine with the Botanical Gardens and the Zoological Gardens to form a magnificent belt of vegetation.

It will be located so that the Commonwealth Forestry School, the University and C.S.I.R. will be within easy access. Rising above it are the upper slopes of Black Mountain and these should be constituted a Reserve complementary, as it were, with the gardens.

From the higher slopes of the gardens, especially above Sullivan's trig-point, the splendid views across the city to the surrounding hills strike one instantly and they should attract many visitors. Some of these views are illustrated in photographs 2, 3, 4, 5 and 6.

2. Area of the Gardens:

To enable the best development of any botanical gardens an area of some size is essential, particularly when the arboretum phase of the Gardens is given its proper proportion in the scheme as should be the case in Canberra. Further, in order that the gardens shall be in keeping with the general scheme of layout for the capital, they should be spacious and susceptible of considerable subdivision.

The writer has not been able to measure the proposed area with any exactitude, but by visual examination it would appear to be about 300 acres. The plantable area is of course reduced by the requirements for roads and paths, by the gullies which cannot be avoided and by the space required for buildings and nursery areas. Just how much the above will reduce the plantable area it is impossible at present to say.

It may be of interest to compare the area of the proposed Canberra Botanical Gardens with those of other gardens in Australia and elsewhere. The Sydney Botanical Gardens cover 88 acres, while those in Melbourne are 100 acres in area. The Royal Botanic Gardens at Kew were originally 15 acres in extent but now cover 95 acres. The Arnold Arboretum commenced with about 125 acres in 1872 and now has 220 acres free of taxes for 1000 years. The New York Botanical Gardens established in 1894 comprise 250 acres and those at Buitenzorg total 89 acres in the city, 173 acres outside and a further 74 acres on the slopes of the volcano of Gede.

It is clear from these comparisons that the area of the proposed gardens in Canberra is reasonable, and this is especially so when one considers land values.

3. Accessibility:

To serve best the public and scientific interest comparative ease of access to the gardens is desirable as is so well illustrated in the case of the Sydney gardens. Access to the proposed site will be obtained from the northern part of the city via University Avenue and from the southern part at Westridge via Garden Gate Drive (Map 103 B) through the Zoological Gardens. When the University Grounds are established access can be had from them to the Botanical Gardens by gate in the north-eastern boundary. The time may come when water access is also possible from Acton across the lake to the gardens.

4. Aspect, Soil, etc.:

(a) Protection from wind is desirable as trees growing in

an area exposed to the buffeting of strong winds tend to grow unsymmetrically and to lean from the upright. In the area proposed a certain measure of protection is given to a considerable part by Black Mountain. The most exposed part will be the peninsula above-noted at the southern end of the gardens. In this it may be necessary to develop windbreak masses of trees in suitable locations. No other available area combines the same scenic beauty with protection from wind.

(b) By utilising the lower slopes of the mountain a further advantage is gained in the reduction of danger from frost damage. Frosts will occur of course but they will be less severe on the slopes as compared with low-lying areas where temperatures of about 10-12° Fah. on the grass have been registered (Acton, June 19th and 20th, 1935). Even so it may be necessary to grow shelter belts or zones in certain cases for the protection of exotic trees, shrubs and smaller plants.

(c) The soil is not ideal either from the point of view of variety or fertility. An ideal site would contain soils derived from under-lying limestones, others from sandstones and still others from igneous rocks, as for example is the case near the junction of Paddy's River and the Cotter. The choice of such a site within the city area is precluded as, with the exception of a small area of laminated porphyries in the northern corner and small areas of quartz porphyry in the west and south, the city area is almost entirely in the zone of Silurian shales and sandstones.

The area proposed for the gardens is thus all of the same formation and the soil, which is part of the alluvial deposit forming a detrital fan at the foot of the mountain, is mainly red and gravelly. The fertility level will gradually be raised by cultural methods and experience with similar soils in other parts of the city area indicates that trees and shrubs should do quite well when once established. Certain types of trees, however, prefer specific types of soils and it would be impossible to develop any large groups of such trees in the absence of such soils. For specimen trees, of course, soil may be provided by transferring requisite quantities to the site.

(d) Drainage problems are of two kinds, viz., those concerning the area as a whole, and those which involve detailed agricultural drainage.

It is certain that, with gardens situated generally on slopes of varying gradient, care will have to be exercised in the provision of run-off ditches, etc. on contour lines, so that soil erosion by water is reduced to a minimum.

The gullies which have developed down the slopes will require treatment to control their further extension during heavy rains as well as to render them susceptible of landscape treatment. They are at present uncontrolled and unsightly.

Agricultural and contour drainage will need to be considered when the detailed layout is settled.

While on the subject of drainage, one naturally thinks of water supplies which are an essential requirement for botanic gardens. With a reservoir on Black Mountain, and a pipe line traversing the area recommended for the gardens, it would seem quite feasible to arrange for reticulation of water supplies for all services in the gardens without great difficulty.

5. Possibilities of sub-division:

It is customary so to arrange the layout of a botanical garden that lawn areas are available and in the Melbourne Gardens for example, there are four, the central, eastern, western and buffalo-grass lawns. In and around these lawns are arranged about forty-two botanical groups with five hundred genera and almost two thousand species.

The area proposed for the Canberra Gardens does not lend itself to a simple layout of lawns because much of it is on slopes of a fairly steep gradient. Two parts do, however, commend themselves in this respect—the area immediately adjoining C.S.I.R., to the South and the area between the present road leading to University Avenue and the north-eastern boundary of the recommended site. It is because this latter area is approximately level that it is recommended to be included in the botanical gardens, although it appears to be allocated as part of the University area. It is here that glass-houses, nursery and propagating sections should be placed as will be noted later.

While other grassed spaces will be relatively limited in size, it will be possible so to arrange planting schemes that adequate spacing among botanical groups or in specialized sections is allowed. In fact, where trees form an important part of the gardens, as they must in these, it is necessary to have space in order to stand away and view them properly.

All botanical gardens develop specialized sections such as alpine rock garden, moraine garden, bog garden, heath garden, iris garden, succulent garden, and so forth.

The rocky slope overlooking Sullivan trig point is susceptible of development as an alpine area, and in fact, should be a striking part of the gardens. The alpines may be grown both above and below the site, where the water tanks once stood, and leading to them the path should be alternated with flights of irregular rock steps. Where the tanks stood is an ideal position for a lookout for the very fine views of the surrounding country and hills, and it is recommended that a shelter or kiosk be erected here.

The quarry which at present is an unsightly scar can also be utilized for rockery plants. It is recommended that the floor of the quarry be levelled and the forward part used as the site of the Gardens refreshment kiosk, which will be required for the convenience of visitors. At rear of the building the quarry face can be utilized for rock plants, especially of the climbing or hanging types. Areas to the north and south forward of the building, each about 20 yards by 45 yards, can be made into parking areas and the part in front from the sunken road up to the refreshment building should preferably be terraced.

In the area adjoining the University, bog, heath, iris, and other such specialised sections can be developed.

The main road through the gardens should be bounded by specimen trees to form a series of avenues, rather than one long avenue, and the breaks so arranged as to allow views along vistas or across the lake to wide views. Similarly the planting of trees anywhere in the Gardens should be carried out so that not only is it possible to see individual specimens, but vistas from various focal points are always available.

III. ROADS, PATHS AND PARKING AREAS

Because of the general shape of the site and its relation to other areas, the main road must traverse the length of the proposed gardens and in part, along the lake margin. It will join University Avenue at the northerly end and the road through the Zoological Gardens at the other end. A branch of it should enter the part of the Gardens marked North America on Map 103 B in order to provide easy access to that part of the Gardens. A short side road will be necessary to accommodate traffic to the glasshouses and propagating section at the left, entering from University Avenue, and a car road leading to the Director's quarters on the right.

It is impossible to lay down anything specific as to paths until a detailed planting plan has been decided upon, but it would seem that little difficulty should be experienced because the area is well supplied with gravel.

Reference has already been made to the possibility of using two areas on either side of the quarry area for parking, which should accommodate sixty or more cars with ease. It may be necessary eventually to arrange another parking area near the University Avenue end of the gardens, particularly for visitors to the glasshouses and the special sections in that part.

IV. BUILDINGS

It is obvious that certain types of buildings are essential in a botanical garden and others, while not essential from one point of view, are recognised as forming part of a complete scheme.

In the nursery area a potting house, seedhouse, shade-house and propagating house are necessary for the regular supply of plants to the gardens. Similarly implement shed, paintshop and toolsheds are required, together with stables if horse-drawn instead of motor driven machinery is used.

For the convenience of visitors it is customary to provide a refreshment kiosk and reference has been made earlier to the possibility of utilizing the quarry site for this purpose. For the further convenience of visitors it has been suggested that a lookout shelter be built on the slope above Sullivan trig. point.

Glasshouses and conservatories form a very prominent feature of botanical gardens in cold climates such as at Christiania, while at Buitenzorg shadehouses are more required. Here in Canberra the climate is such that, if any attempt is made to present examples of collections like orchids, foliage plants, tropicals and ferns, glasshouses are essential. There is no doubt about the attractiveness of glasshouses and conservatories to visitors and on this count alone, some should be erected in the Canberra botanical gardens. They would be available for scientific work as well as functioning as show places.

Gardeners' quarters should be provided in order to enable the necessary supervision of the gardens at any time. In the Melbourne gardens, in addition to the Director's house, there are cottages for three gardeners and a carpenter, erected at convenient points, and in Sydney the superintendent and overseer live in the grounds. At least two cottages would be necessary in this case, one near each end of the main road traversing the gardens and a third is desirable in the glasshouse and nursery area, especially for oversight during winter.

It is usual in botanical gardens of any consequence to have the Director live on the ground and if the scheme for gardens in Canberra comes to fruition, such provision should eventually be made in this case, especially as the site is relatively distant from residential areas.

A working laboratory, not necessarily very large, and an office are obvious requirements. Adjoining the office it will be necessary to have a room for a library because it is inevitable that, once a garden is established, publications and reference books will be required for ready use in connection with the acquirement, and care of collections of plants and trees.

V. COSTS OF MAINTENANCE

The cost of maintaining a botanical garden is greatly in excess of that for a park of the same area because it is more intensively developed from the landscape and horti-cultural point of view, as well as being specially developed botanically. It is in fact a great museum or exhibition of living plants, all of which must be specially tended and labelled under the care of experts. In many cases the trees and plants are also more costly to obtain in the first place, particularly when rare types are desired for the completion of collections.

It is impossible to make more than a provisional estimate of the annual cost for the maintenance of botanical gardens in Canberra, once they are established, until the actual scope of the gardens is determined, but a fair idea may be gained by considering the costs of similar gardens elsewhere. The Sydney Botanic Gardens cover about 88 acres with approximately one-third of an acre of glass-houses, one-sixth acre of propagating frames, one-fifth acre for Bush and Aquatic houses and a little over an acre of nursery or propagating grounds. The gardening staff is made up as follows:

3 gardeners, special class
4 gardeners, first class

18 gardeners
3 youths, junior gardeners
1 patrolman
23 labourers
1 aviary keeper.

In addition there are 4 employees whose services are more or less general. Namely, a landscape gardener, a painter and label-writer, a carpenter and a plumber. These four are also employed in connection with work in other grounds under the control of the Department of Agriculture.

The approximate cost in wages and salaries for the above at present rates works out at £12,000 per annum and a further £1,300 per annum is required for maintenance and working expenses.

In the Melbourne gardens the glasshouses cover 500 sq. ft. for tropical plants and 2400 sq. ft. for smaller displays and propagation purposes. The staff, including in this case the Director and 3 technical assistants totals 56 and the annual maintenance cost totals about £13,600.

In Adelaide, with a garden limited to 40 acres and including 2 greenhouses, 1 large conservatory, and several store houses, the gardening staff totals 24. Excluding the Director's salary the annual cost of maintenance is £5680.

It would seem that to maintain Botanical Gardens in Canberra, of a size and kind which would be in keeping with the national capital, an annual expenditure of not less than £15,000 per annum is required once the gardens are properly established. This estimate does not include the salaries of a Director and Superintendent or other technical officers who might ultimately be appointed. It is also to be understood that this figure applies only when the botanical gardens are fully established and during early years the amount required will depend on the rate and scope of development.

VI. SCHEME OF DEVELOPMENT

If approval is given to the choice of site and it is decided to initiate work on the gardens it is obvious that very careful consideration will have to be given to the plans for the main layout. This will take some time but it need not prevent the prosecution of certain preliminary phases of development in which casual labour could usefully be employed.

The quarry area could be cleared of rubble, the face of the quarry improved by the removal of loose blocks and by shaping, the parking areas on either side levelled and the area in front terraced to the present sunken road. This is a prominent feature of the proposed area.

Practically all the work required to control the gullies could be carried out before planting is commenced. It is recommended that the upper parts of the gullies be cleared of loose gravel and so cut that series of small cascades and pools are made. Where necessary concrete retaining banks should be put in to prevent further cutting out and in the lower parts concrete basins of irregular outline set in to form the pools. Finally the outlets under the lake road should be constructed. Preparatory work of this nature will enable an early start to be made in clothing the gullies with plants and ferns.

The construction of the main road system is an important piece of work which can well be carried out at this stage not only because it is an essential, the location of which is easily determined, but because it will be available from the beginning for traffic during the planting of the gardens. A further advantage in early construction of this road would seem to be the utilization of a considerable quantity of stone from the site for the foundation. In suggesting this I have not consulted the Department and it may, of course, be that the stone is not suitable for the purpose.

In any case the clearing of stone and gravel from the surface of the site is another job which should be done in the early stages of preparation. This can be joined with a certain amount of grading which will be necessary in some parts. A number of trees at present on the site are unsuitable either because of position or because they are ill-shaped or partly dead. These require to be felled and grubbed out as all old stumps must be cleared.

Following the planning of the layout there will still be a considerable amount of work for which casual labour will be suitable in the way of grading, contour drainage, construction of paths and trenching for water reticulation. Planting of the trees in the main vistas and groups will take several years but it should be commenced at the earliest moment possible so that results may begin to appear in a reasonable time. During the period of establishment of the trees and large shrubs attention can be turned to the development of specialized areas or sections and to the general horticultural or floricultural treatment. Thus there will be a gradual organized evolution of the botanical gardens from which the most satisfactory results will be obtained.

The erection of glasshouses could also be spread over several years thus distributing capital expenditure.

I have not attempted to estimate the total capital expenditure required for the construction of roads and paths, the installation of water, the erection of buildings and glasshouses and so forth, as that seems to me to require departmental consideration, but obviously it will involve a fairly large sum. Instead I have indicated what seem to me to be the chief requirements if the botanical gardens of Canberra are to be worthy of the national capital.

B. J. Dickson
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The Gardens are devoted exclusively to the growing of Australian native plants. Part of Canberra, Australia's National Capital, can be seen in the background

